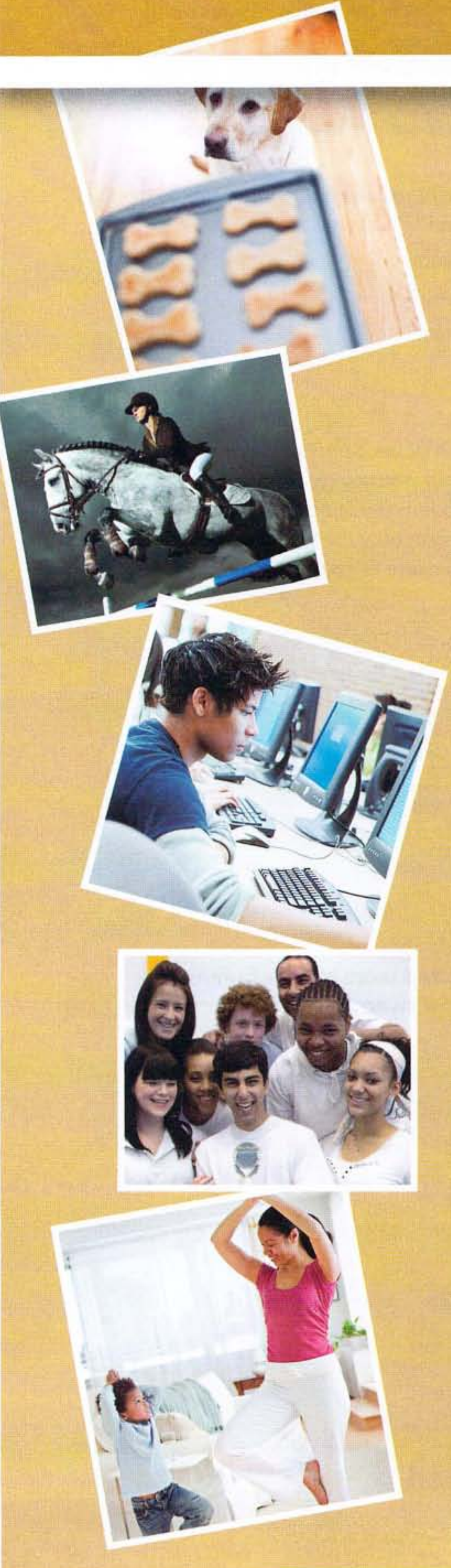
Unit VI



Learning

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When a chinook salmon first emerges from its egg in a stream's gravel bed, its genes provide most of the behavioral instructions it needs for life. It knows instinctively how and where to swim, what to eat, and most spectacularly, where to go and when and how to return to its birthplace. Guided by the scent of its home stream, it pursues an upstream odyssey to its ancestral spawning ground and seeks out the best gravel and water flow for breeding. It then mates and, its life mission accomplished, dies.

Unlike salmon, we are not born with a genetic plan for life. Much of what we do we learn from experience. Although we struggle to find the life direction a salmon is born with, our learning gives us more flexibility. We can learn how to build grass huts or snow shelters, submarines or space stations, and thereby adjust to almost any environment. Indeed, nature's most important gift to us may be our *adaptability*—our capacity to learn new behaviors that help us cope with changing circumstances.

Learning breeds hope. What is learnable we can potentially teach—a fact that encourages parents, teachers, coaches, and animal trainers. What has been learned we can potentially change by new learning—an assumption that underlies counseling, psychotherapy, and rehabilitation programs. No matter how unhappy, unsuccessful, or unloving we are, that need not be the end of our story.

No topic is closer to the heart of psychology than *learning*. In earlier units we considered how we learn to think critically, and the learning of visual perceptions and of a drug's expected effect. In later units we will see how learning shapes our thoughts and language, our motivations and emotions, our personalities and attitudes. In Unit VII, we will see how the brain stores and retrieves learning.

Module 26

How We Learn and Classical Conditioning

Ken Gillespie Photography/Alamy

Module Learning Objectives

26-1 Define learning, and identify some basic forms of learning.

26-2 Describe the basic components of classical conditioning, and explain behaviorism's view of learning.

26-3 Summarize the processes of acquisition, extinction, spontaneous recovery, generalization, and discrimination.

26-4 Explain why Pavlov's work remains so important, and describe some applications of his work to human health and well-being.

How Do We Learn?

26-1 What is learning, and what are some basic forms of learning?

Psychologists define **learning** as the process of acquiring new and relatively enduring information or behaviors. By learning, we humans are able to adapt to our environments. We learn to expect and prepare for significant events such as food or pain *(classical conditioning)*. We typically learn to repeat acts that bring rewards and to avoid acts that bring unwanted results *(operant conditioning)*. We learn new behaviors by observing events and by watching others, and through language we learn things we have neither experienced nor observed *(cognitive learning)*. But *how* do we learn?

learning the process of acquiring new and relatively enduring information or behaviors.

More than 200 years ago, philosophers such as John Locke and David Hume echoed Aristotle's conclusion from 2000 years earlier: We learn by *association*. Our minds naturally

Try This

Most of us would be unable to name the order of the songs on our favorite album or playlist. Yet, hearing the end of one piece cues (by association) an anticipation of the next. Likewise, when singing your national anthem, you associate the end of each line with the beginning of the next. (Pick a line out of the middle and notice how much harder it is to recall the *previous* line.)

connect events that occur in sequence. Suppose you see and smell freshly baked bread, eat some, and find it satisfying. The next time you see and smell fresh bread, you will expect that eating it will again be satisfying. So, too, with sounds. If you associate a sound with a frightening consequence, hearing the sound alone may trigger your fear. As one 4-year-old exclaimed after watching a TV character get mugged, "If I had heard that music, I wouldn't have gone around the corner!" (Wells, 1981).

Learned associations often operate subtly. Give people a red pen (associated with error marking) rather than a black pen and, when correcting essays, they will spot more errors and give lower grades (Rutchick et al., 2010). When voting, people are more likely to support taxes to aid education if their assigned voting place is in a school (Berger et al., 2008).

Learned associations also feed our habitual behaviors (Wood & Neal, 2007). As we repeat behaviors in a given context—sleeping in a certain posture in bed, walking certain routes from class to class, eating popcorn in a movie theater—the behaviors become associated with the contexts. Our next experience of the context then evokes our habitual response. How long does it take to form such habits? To find out, one British research team asked 96 university students to choose some healthy behavior (such as running before dinner or eating fruit with lunch), to do it daily for 84 days, and to record whether the behavior felt automatic (something they did without thinking and would find it hard not to do). On average, behaviors became habitual after about 66 days (Lally et al., 2010). (Is there something you'd like to make a routine part of your life? Just do it every day for two months, or a bit longer for exercise, and you likely will find yourself with a new habit.)

AP® Exam Tip

It's easy to confuse habituation with sensory adaptation, a concept from Unit IV. Recall that sensory adaptation occurs when one of your sensory systems stops registering the presence of an unchanging stimulus—when you go swimming in a cool pool, for example, the water no longer feels cool after you've been in for a few minutes. Habituation, like sensory adaptation, involves a diminished response, but in this case it's a form of learning rather than a function of the sensory system. If you're exposed to the same stimulus over and over, your response decreases. A friend might sneak up and startle you by yelling "Boo!" But you'll probably startle less when he tries it again two minutes later. That's habituation.

Other animals also learn by association. Disturbed by a squirt of water, the sea slug *Aplysia* protectively withdraws its gill. If the squirts continue, as happens naturally in choppy water, the withdrawal response diminishes. We say the slug **habituates.** But if the sea slug repeatedly receives an electric shock just after being squirted, its response to the squirt instead grows stronger. The animal has associated the squirt with the impending shock.

Complex animals can learn to associate their own behavior with its outcomes. An aquarium seal will repeat behaviors, such as slapping and barking, that prompt people to toss it a herring.

By linking two events that occur close together, both animals are exhibiting **associative learning.** The sea slug associates the squirt with an impending shock; the seal associates slapping and barking with a herring treat. Each animal has learned something important to its survival: predicting the immediate future.

This process of learning associations is *conditioning,* and it takes two main forms:

- In *classical conditioning,* we learn to associate two stimuli and thus to anticipate events. (A **stimulus** is any event or situation that evokes a response.) We learn that a flash of lightning signals an impending crack of thunder; when lightning flashes nearby, we start to brace ourselves (**FIGURE 26.1**).
- In *operant conditioning,* we learn to associate a response (our behavior) and its consequence. Thus we (and other animals) learn to repeat acts followed by good results (**FIGURE 26.2**) and avoid acts followed by bad results.

To simplify, we will explore these two types of associative learning separately. Often, though, they occur together, as on one Japanese cattle ranch, where the clever rancher outfitted his herd with electronic pagers, which he calls from his cell phone. After a week of training, the animals learn to associate two stimuli—the beep on their pager and the arrival of food (classical conditioning). But they also learn to associate their hustling to the food trough with the pleasure of eating (operant conditioning).

habituation an organism's decreasing response to a stimulus with repeated exposure to it.

associative learning learning that certain events occur together. The events may be two stimuli (as in classical conditioning) or a response and its consequences (as in operant conditioning).

stimulus any event or situation that evokes a response.

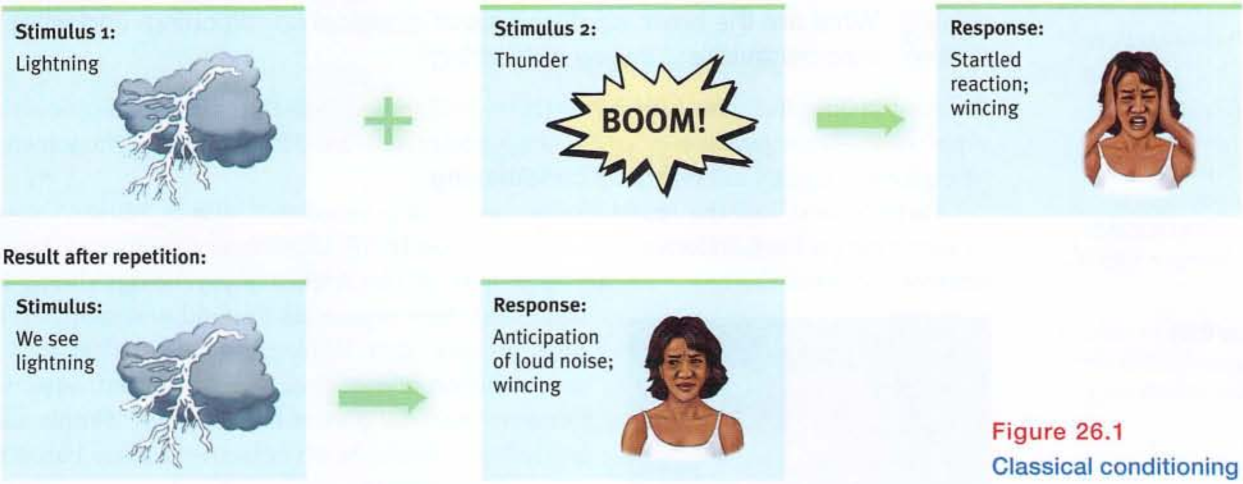


Figure 26.1
Classical conditioning

Conditioning is not the only form of learning. Through **cognitive learning** we acquire mental information that guides our behavior. *Observational learning,* one form of cognitive learning, lets us learn from others' experiences. Chimpanzees, for example, sometimes learn behaviors merely by watching others perform them. If one animal sees another solve a puzzle and gain a food reward, the observer may perform the trick more quickly. So, too, in humans: We look and we learn.

Figure 26.2
Operant conditioning

Let's look more closely now at classical conditioning.

cognitive learning the acquisition of mental information, whether by observing events, by watching others, or through language.

Before You Move On

▶ ASK YOURSELF

Can you remember some example from your childhood of learning through classical conditioning—perhaps salivating at the sound or smell of some delicious food cooking in your family kitchen? Can you remember an example of operant conditioning, when you repeated (or decided not to repeat) a behavior because you liked (or hated) its consequences? Can you recall watching someone else perform some act and later repeating or avoiding that act?

▶ TEST YOURSELF

As we develop, we learn cues that lead us to expect and prepare for good and bad events. We learn to repeat behaviors that bring rewards. And we watch others and learn. What do psychologists call these three types of learning?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

classical conditioning a type of learning in which one learns to link two or more stimuli and anticipate events.

behaviorism the view that psychology (1) should be an objective science that (2) studies behavior without reference to mental processes. Most research psychologists today agree with (1) but not with (2).

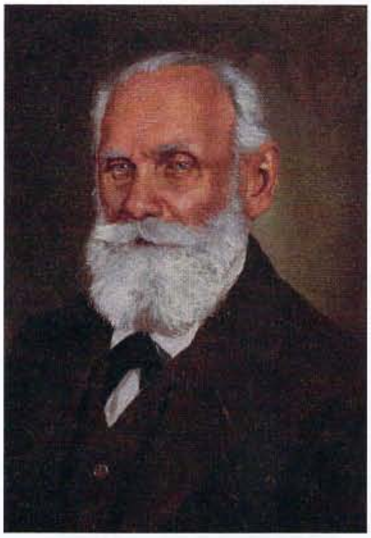
neutral stimulus (NS) in classical conditioning, a stimulus that elicits no response before conditioning.

Classical Conditioning

26-2 What are the basic components of classical conditioning, and what was behaviorism's view of learning?

For many people, the name Ivan Pavlov (1849–1936) rings a bell. His early twentieth-century experiments—now psychology's most famous research—are classics, and the phenomenon he explored we justly call **classical conditioning.**

Pavlov's work laid the foundation for many of psychologist John B. Watson's ideas. In searching for laws underlying learning, Watson (1913) urged his colleagues to discard reference to inner thoughts, feelings, and motives. The science of psychology should instead study how organisms respond to stimuli in their environments, said Watson: "Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods." Simply said, psychology should be an objective science based on observable behavior.



Ivan Pavlov "Experimental investigation . . . should lay a solid foundation for a future true science of psychology" (1927).

This view, which influenced North American psychology during the first half of the twentieth century, Watson called **behaviorism.** Pavlov and Watson shared both a disdain for "mentalistic" concepts (such as consciousness) and a belief that the basic laws of learning were the same for all animals—whether dogs or humans. Few researchers today propose that psychology should ignore mental processes, but most now agree that classical conditioning is a basic form of learning by which all organisms adapt to their environment.

Pavlov's Experiments

Pavlov was driven by a lifelong passion for research. After setting aside his initial plan to follow his father into the Russian Orthodox priesthood, Pavlov received a medical degree at age 33 and spent the next two decades studying the digestive system. This work earned him Russia's first Nobel Prize in 1904. But his novel experiments on learning, which consumed the last three decades of his life, earned this feisty scientist his place in history.

PEANUTS

Pavlov's new direction came when his creative mind seized on an incidental observation. Without fail, putting food in a dog's mouth caused the animal to salivate. Moreover, the dog began salivating not only at the taste of the food, but also at the mere sight of the food, or at the food dish, or at the person delivering the food, or even at the sound of that person's approaching footsteps. At first, Pavlov considered these "psychic secretions" an annoyance—until he realized they pointed to a simple but important form of learning.

Pavlov and his assistants tried to imagine what the dog was thinking and feeling as it drooled in anticipation of the food. This only led them into fruitless debates. So, to explore the phenomenon more objectively, they experimented. To eliminate other possible influences, they isolated the dog in a small room, secured it in a harness, and attached a device to divert its saliva to a measuring instrument (**FIGURE 26.3**). From the next room, they presented food—first by sliding in a food bowl, later by blowing meat powder into the dog's mouth at a precise moment. They then paired various **neutral stimuli (NS)**—events the dog could see or hear but didn't associate with food—with food in the dog's mouth. If a sight or sound regularly signaled the arrival of food, would the dog learn the link? If so, would it begin salivating in anticipation of the food?

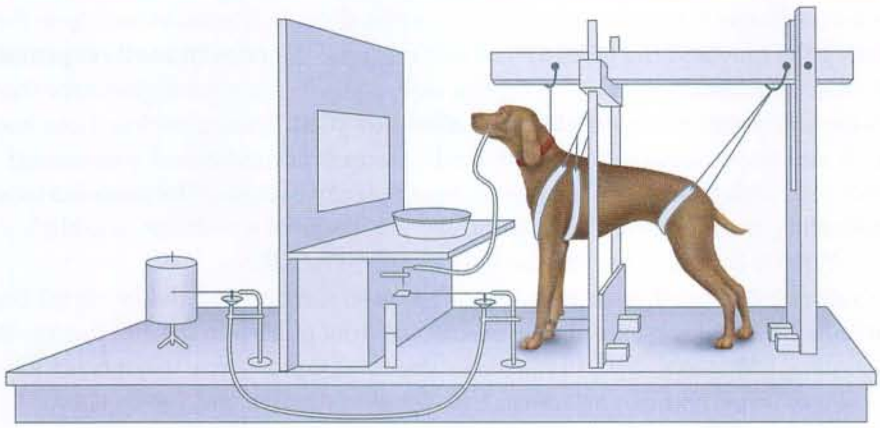


Figure 26.3

Pavlov's device for recording salivation A tube in the dog's cheek collects saliva, which is measured in a cylinder outside the chamber.

unconditioned response (UR) in classical conditioning, an unlearned, naturally occurring response (such as salivation) to an unconditioned stimulus (US) (such as food in the mouth).

unconditioned stimulus (US) in classical conditioning, a stimulus that unconditionally—naturally and automatically—triggers a response (UR).

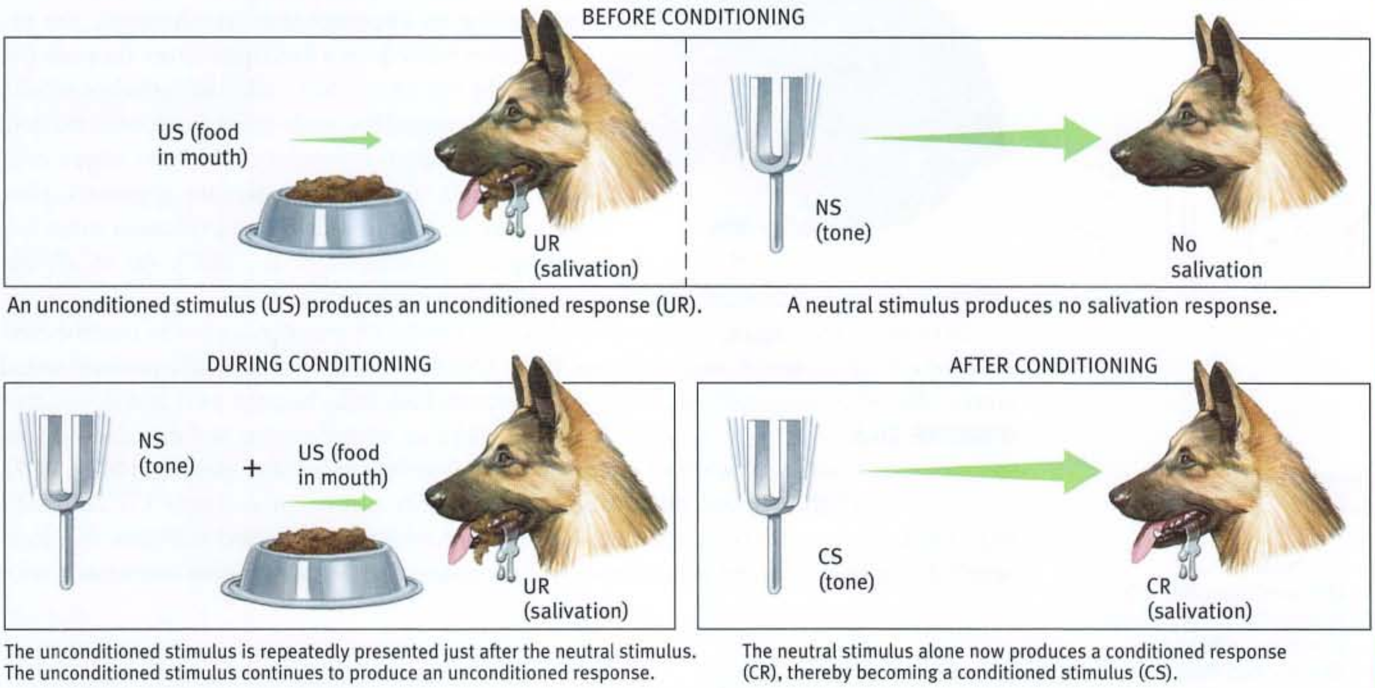
The answers proved to be *Yes* and *Yes.* Just before placing food in the dog's mouth to produce salivation, Pavlov sounded a tone. After several pairings of tone and food, the dog, now anticipating the meat powder, began salivating to the tone alone. In later experiments, a buzzer,[1] a light, a touch on the leg, even the sight of a circle set off the drooling. (This procedure works with people, too. When hungry young Londoners viewed abstract figures before smelling peanut butter or vanilla, their brain soon responded in anticipation to the abstract images alone [Gottfried et al., 2003].)

A dog doesn't learn to salivate in response to food in its mouth. Food in the mouth automatically, *unconditionally,* triggers a dog's salivary reflex (**FIGURE 26.4**). Thus, Pavlov called the drooling an **unconditioned response (UR).** And he called the food an **unconditioned stimulus (US).**

[1] The "buzzer" (English translation) was perhaps Pavlov's supposed bell—a small electric bell (Tully, 2003).

Figure 26.4

Pavlov's classic experiment Pavlov presented a neutral stimulus (a tone) just before an unconditioned stimulus (food in mouth). The neutral stimulus then became a conditioned stimulus, producing a conditioned response.



conditioned response (CR) in classical conditioning, a learned response to a previously neutral (but now conditioned) stimulus (CS).

conditioned stimulus (CS) in classical conditioning, an originally irrelevant stimulus that, after association with an unconditioned stimulus (US), comes to trigger a conditioned response (CR).

acquisition in classical conditioning, the initial stage, when one links a neutral stimulus and an unconditioned stimulus so that the neutral stimulus begins triggering the conditioned response. In operant conditioning, the strengthening of a reinforced response.

higher-order conditioning a procedure in which the conditioned stimulus in one conditioning experience is paired with a new neutral stimulus, creating a second (often weaker) conditioned stimulus. For example, an animal that has learned that a tone predicts food might then learn that a light predicts the tone and begin responding to the light alone. (Also called *second-order conditioning.*)

Salivation in response to the tone, however, is learned. Because it is *conditional* upon the dog's associating the tone and the food, we call this response the **conditioned response (CR).** The stimulus that used to be neutral (in this case, a previously meaningless tone that now triggers the salivation) is the **conditioned stimulus (CS).** Distinguishing these two kinds of stimuli and responses is easy: Conditioned = learned; *un*conditioned = *un*learned.

Let's check your understanding with a second example. An experimenter sounds a tone just before delivering an air puff to your blinking eye. After several repetitions, you blink to the tone alone. What is the NS? The US? The UR? The CS? The CR?[2]

If Pavlov's demonstration of associative learning was so simple, what did he do for the next three decades? What discoveries did his research factory publish in his 532 papers on salivary conditioning (Windholz, 1997)? He and his associates explored five major conditioning processes: *acquisition, extinction, spontaneous recovery, generalization,* and *discrimination.*

ACQUISITION

26-3 In classical conditioning, what are the processes of acquisition, extinction, spontaneous recovery, generalization, and discrimination?

To understand the **acquisition,** or initial learning, of the stimulus-response relationship, Pavlov and his associates had to confront the question of timing: How much time should elapse between presenting the NS (the tone, the light, the touch) and the US (the food)? In most cases, not much—half a second usually works well.

What do you suppose would happen if the food (US) appeared before the tone (NS) rather than after? Would conditioning occur? Not likely. With but a few exceptions, conditioning doesn't happen when the NS follows the US. *Remember, classical conditioning is biologically adaptive because it helps humans and other animals prepare for good or bad events.* To Pavlov's dogs, the originally neutral tone became a (CS) after signaling an important biological event—the arrival of food (US). To deer in the forest, the snapping of a twig (CS) may signal a predator's approach (US). If the good or bad event has already occurred, the tone or the sound won't help the animal prepare.

Eric Isselée/Shutterstock

More recent research on male Japanese quail shows how a CS can signal another important biological event (Domjan, 1992, 1994, 2005). Just before presenting an approachable female quail, the researchers turned on a red light. Over time, as the red light continued to herald the female's arrival, the light caused the male quail to become excited. They developed a preference for their cage's red-light district, and when a female appeared, they mated with her more quickly and released more semen and sperm (Matthews et al., 2007). All in all, the quail's capacity for classical conditioning gives it a reproductive edge.

In humans, too, objects, smells, and sights associated with sexual pleasure can become conditioned stimuli for sexual arousal (Byrne, 1982). Onion breath does not usually produce sexual arousal. But when repeatedly paired with a passionate kiss, it can become a CS and do just that (**FIGURE 26.5**). The larger lesson: *Conditioning helps an animal survive and reproduce—by responding to cues that help it gain food, avoid dangers, locate mates, and produce offspring* (Hollis, 1997).

Through **higher-order conditioning,** a new NS can become a new CS. All that's required is for it to become associated with a previously conditioned stimulus. If a tone regularly signals food and produces salivation, then a light that becomes associated with

FYI

Remember:
NS = **N**eutral **S**timulus
US = **U**nconditioned **S**timulus
UR = **U**nconditioned **R**esponse
CS = **C**onditioned **S**timulus
CR = **C**onditioned **R**esponse

[2] NS = tone before procedure; US = air puff; UR = blink to air puff; CS = tone after procedure; CR = blink to tone

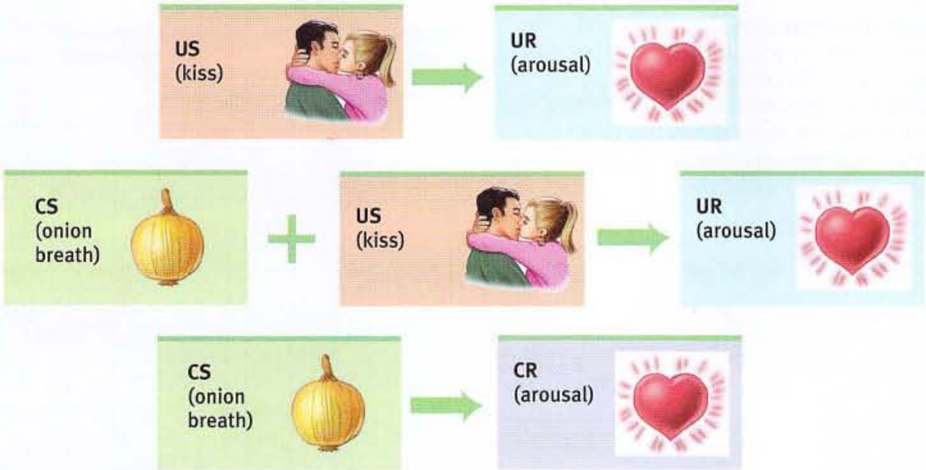


Figure 26.5

An unexpected CS Psychologist Michael Tirrell (1990) recalled: "My first girlfriend loved onions, so I came to associate onion breath with kissing. Before long, onion breath sent tingles up and down my spine. Oh what a feeling!"

the tone may also begin to trigger salivation. Although this higher-order conditioning (also called *second-order conditioning*) tends to be weaker than first-order conditioning, it influences our everyday lives. Imagine that something makes us very afraid (perhaps a guard dog associated with a previous dog bite). If something else, such as the sound of a barking dog, brings to mind that guard dog, the bark alone may make us feel a little afraid.

EXTINCTION AND SPONTANEOUS RECOVERY

What would happen, Pavlov wondered, if after conditioning, the CS occurred repeatedly without the US? If the tone sounded again and again, but no food appeared, would the tone still trigger salivation? The answer was mixed. The dogs salivated less and less, a reaction known as **extinction,** the diminished responding that occurs when the CS (tone) no longer signals an impending US (food). But a different picture emerged when Pavlov allowed several hours to elapse before sounding the tone again. After the delay, the dogs would again begin salivating to the tone (**FIGURE 26.6**). This **spontaneous recovery**—the reappearance of a (weakened) CR after a pause—suggested to Pavlov that extinction was *suppressing* the CR rather than eliminating it.

GENERALIZATION

Pavlov and his students noticed that a dog conditioned to the sound of one tone also responded somewhat to the sound of a new and different tone. Likewise, a dog conditioned to salivate when rubbed would also drool a bit when scratched (Windholz, 1989) or when touched on a different body part (**FIGURE 26.7** on the next page). This tendency to respond likewise to stimuli similar to the CS is called **generalization.**

extinction the diminishing of a conditioned response; occurs in classical conditioning when an unconditioned stimulus (US) does not follow a conditioned stimulus (CS); occurs in operant conditioning when a response is no longer reinforced.

spontaneous recovery the reappearance, after a pause, of an extinguished conditioned response.

generalization the tendency, once a response has been conditioned, for stimuli similar to the conditioned stimulus to elicit similar responses.

AP® Exam Tip

Spontaneous recovery is, in fact, spontaneous. Notice that the extinguished conditioned response returns without any additional pairing with the unconditioned stimulus. It is not a form of acquisition.

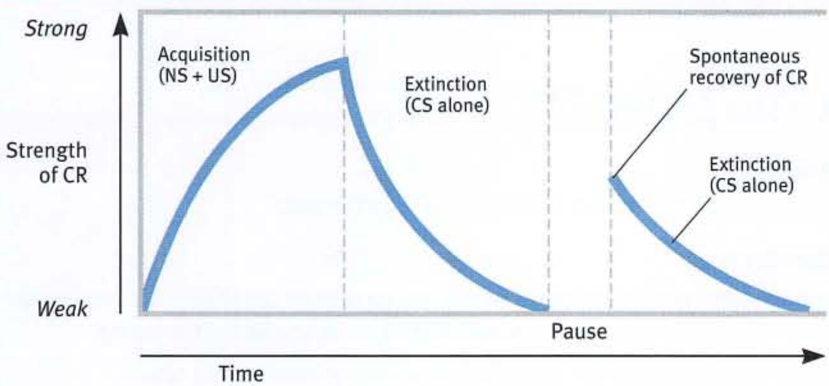
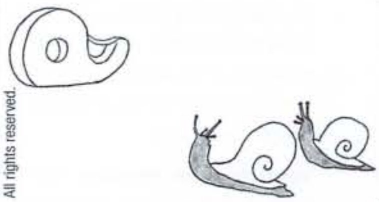


Figure 26.6

Idealized curve of acquisition, extinction, and spontaneous recovery The rising curve shows that the CR rapidly grows stronger as the NS becomes a CS as it is repeatedly paired with the US *(acquisition)*, then weakens as the CS is presented alone *(extinction)*. After a pause, the CR reappears *(spontaneous recovery)*.

Figure 26.7

Generalization Pavlov demonstrated generalization by attaching miniature vibrators to various parts of a dog's body. After conditioning salivation to stimulation of the thigh, he stimulated other areas. The closer a stimulated spot was to the dog's thigh, the stronger the conditioned response. (From Pavlov, 1927.)



"I don't care if she's a tape dispenser. I love her."

Generalization can be adaptive, as when toddlers taught to fear moving cars also become afraid of moving trucks and motorcycles. And generalized fears can linger. One Argentine writer who underwent torture still recoils with fear when he sees black shoes—his first glimpse of his torturers as they approached his cell. Generalized anxiety reactions have been demonstrated in laboratory studies comparing abused with nonabused children. When an angry face appears on a computer screen, abused children's brain-wave responses are dramatically stronger and longer lasting (Pollak et al., 1998).

Stimuli similar to naturally disgusting objects will, by association, also evoke some disgust, as otherwise desirable fudge does when shaped to resemble dog feces (Rozin et al., 1986). Researchers have also found that we like unfamiliar people more if they look somewhat like someone we've learned to like rather than dislike (Verosky & Todorov, 2010). (They find this by subtly morphing the facial features of someone we've learned to like or dislike onto a novel face.) In each of these human examples, people's emotional reactions to one stimulus have generalized to similar stimuli.

AP® Exam Tip

Generalization and discrimination are introduced in this module, but they don't just apply to classical conditioning. These two concepts will show up in other types of learning as well.

DISCRIMINATION

Pavlov's dogs also learned to respond to the sound of a particular tone and *not* to other tones. This learned ability to *distinguish* between a conditioned stimulus (which predicts the US) and other irrelevant stimuli is called **discrimination.** Being able to recognize differences is adaptive. Slightly different stimuli can be followed by vastly different consequences. Confronted by a guard dog, your heart may race; confronted by a guide dog, it probably will not.

discrimination in classical conditioning, the learned ability to distinguish between a conditioned stimulus and stimuli that do not signal an unconditioned stimulus.

Before You Move On

▶ ASK YOURSELF

How have your emotions or behaviors been classically conditioned?

▶ TEST YOURSELF

In slasher movies, sexually arousing images of women are sometimes paired with violence against women. Based on classical conditioning principles, what might be an effect of this pairing?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Pavlov's Legacy

26-4 Why does Pavlov's work remain so important, and what have been some applications of his work to human health and well-being?

What remains today of Pavlov's ideas? A great deal. Most psychologists now agree that classical conditioning is a basic form of learning. Judged by today's knowledge of the interplay of our biology, psychology, and social-cultural environment, Pavlov's ideas were incomplete. But if we see further than Pavlov did, it is because we stand on his shoulders.

Why does Pavlov's work remain so important? If he had merely taught us that old dogs can learn new tricks, his experiments would long ago have been forgotten. Why should we care that dogs can be conditioned to salivate at the sound of a tone? The importance lies first in this finding: *Many other responses to many other stimuli can be classically conditioned in many other organisms*—in fact, in every species tested, from earthworms to fish to dogs to monkeys to people (Schwartz, 1984). Thus, classical conditioning is one way that virtually all organisms learn to adapt to their environment.

Second, *Pavlov showed us how a process such as learning can be studied objectively.* He was proud that his methods involved virtually no subjective judgments or guesses about what went on in a dog's mind. The salivary response is a behavior measurable in cubic centimeters of saliva. Pavlov's success therefore suggested a scientific model for how the young discipline of psychology might proceed—by isolating the basic building blocks of complex behaviors and studying them with objective laboratory procedures.

APPLICATIONS OF CLASSICAL CONDITIONING

Other units in this text—on consciousness, motivation, emotion, health, psychological disorders, and therapy—show how Pavlov's principles can influence human health and well-being. Two examples:

- Former drug users often feel a craving when they are again in the drug-using context—with people or in places they associate with previous highs. Thus, drug counselors advise addicts to steer clear of people and settings that may trigger these cravings (Siegel, 2005).
- Classical conditioning even works on the body's disease-fighting immune system. When a particular taste accompanies a drug that influences immune responses, the taste by itself may come to produce an immune response (Ader & Cohen, 1985).

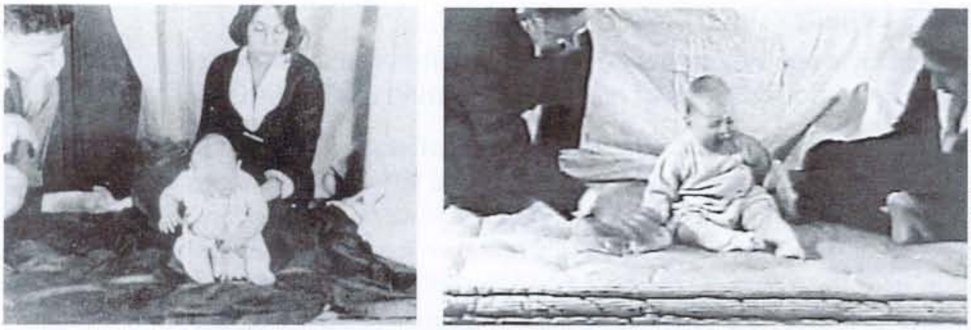
Pavlov's work also provided a basis for Watson's (1913) idea that human emotions and behaviors, though biologically influenced, are mainly a bundle of conditioned responses. Working with an 11-month-old, Watson and Rosalie Rayner (1920; Harris, 1979) showed how specific fears might be conditioned. Like most infants, "Little Albert" feared loud noises but not white rats. Watson and Rayner presented a white rat and, as Little Albert reached to touch it, struck a hammer against a steel bar just behind his head. After seven repeats of seeing the rat and hearing the frightening noise, Albert burst into tears at the mere sight of the rat. Five days later, he had generalized this startled fear reaction to the sight of a rabbit, a dog, and a sealskin coat, but not to dissimilar objects, such as toys.

For years, people wondered what became of Little Albert. Not until 2009 did some psychologist-sleuths identify him as Douglas Merritte, the son of a campus hospital wet nurse who received $1 for her tot's participation. Sadly, Albert died at age 6, apparently having suffered all his short life from congenital hydrocephalus, complicated later by meningitis. This brain damage probably influenced his behavior during Watson and Rayner's experiment (Beck et al., 2009, 2010; Fridlund et al., 2012a,b). People also wondered what became of Watson. After losing his Johns Hopkins professorship over an affair with Rayner (whom he later married), he joined an advertising agency as the company's resident psychologist. There he used his knowledge of associative learning to conceive many successful advertising campaigns, including one for Maxwell House that helped make the "coffee break" an American custom (Hunt, 1993).

John B. Watson Watson (1924) admitted to "going beyond my facts" when offering his famous boast: "Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors."

Little Albert In Watson and Rayner's experiments, "Little Albert" learned to fear a white rat after repeatedly experiencing a loud noise as the rat was presented. In this experiment, what was the US? The UR? The NS? The CS? The CR?

ANSWERS: The US was the loud noise; the UR was the fear response; the NS was the rat before it was paired with the noise; the CS was the rat after pairing; the CR was fear.



Both images Archives of the History of American Psychology, The University of Akron

The treatment of Little Albert would be unacceptable by today's ethical standards. Also, some psychologists, noting that the infant's fear wasn't learned quickly, had difficulty repeating Watson and Rayner's findings with other children. Nevertheless, Little Albert's learned fears led many psychologists to wonder whether each of us might be a walking repository of conditioned emotions. If so, might extinction procedures or even new conditioning help us change our unwanted responses to emotion-arousing stimuli? One patient, who for 30 years had feared going into an elevator alone, did just that. Following his therapist's advice, he forced himself to enter 20 elevators a day. Within 10 days, his fear had nearly vanished (Ellis & Becker, 1982). With support from AirTran, comedian-writer Mark Malkoff likewise extinguished his fear of flying. He lived on an airplane for 30 days, taking 135 flights that had him in the air 14 hours a day (NPR, 2009). After a week and a half, his fears had faded and he began playing games with fellow passengers. (His favorite antic was the "toilet paper experiment": He'd put one end of a roll in the toilet, unroll the rest down the aisle, and flush. The entire roll would be sucked down in three seconds.) In Units XII and XIII we will see more examples of how psychologists use behavioral techniques to treat emotional disorders and promote personal growth.

Module 26 Review

26-1 What is learning, and what are some basic forms of learning?

- *Learning* is the process of acquiring new and relatively enduring information or behaviors.
- In *associative learning,* we learn that certain events occur together.
- In classical conditioning, we learn to associate two or more stimuli (a *stimulus* is any event or situation that evokes a response).
- In operant conditioning, we learn to associate a response and its consequences.
- Through *cognitive learning,* we acquire mental information that guides our behavior. For example, in observational learning, we learn new behaviors by observing events and watching others.

26-2 What are the basic components of classical conditioning, and what was behaviorism's view of learning?

- *Classical conditioning* is a type of learning in which an organism comes to associate stimuli.
- In classical conditioning, an *NS* is a stimulus that elicits no response before conditioning.
- A *UR* is an event that occurs naturally (such as salivation), in response to some stimulus.
- A *US* is something that naturally and automatically (without learning) triggers the unlearned response (as food in the mouth triggers salivation).
- A *CS* is a previously neutral stimulus (such as a tone) that, after association with a US (such as food) comes to trigger a CR.
- A *CR* is the learned response (salivating) to the originally neutral (but now conditioned) stimulus.
- Ivan Pavlov's work on classical conditioning laid the foundation for *behaviorism,* the view that psychology should be an objective science that studies behavior without reference to mental processes.
- The behaviorists believed that the basic laws of learning are the same for all species, including humans.

26-3 In classical conditioning, what are the processes of acquisition, extinction, spontaneous recovery, generalization, and discrimination?

- In classical conditioning, *acquisition* is associating an NS with the US so that the NS begins triggering the CR.
- Acquisition occurs most readily when the NS is presented just before (ideally, about a half-second before) a US, preparing the organism for the upcoming event. This finding supports the view that classical conditioning is biologically adaptive. Through *higher-order conditioning,* a new NS can become a new CS.
- *Extinction* is diminished responding when the CS no longer signals an impending US.
- *Spontaneous recovery* is the appearance of a formerly extinguished response, following a rest period.
- *Generalization* is the tendency to respond to stimuli that are similar to a CS.
- *Discrimination* is the learned ability to distinguish between a CS and other irrelevant stimuli.

26-4 Why does Pavlov's work remain so important, and what have been some applications of his work to human health and well-being?

- Pavlov taught us that significant psychological phenomena can be studied objectively, and that classical conditioning is a basic form of learning that applies to all species.
- Classical conditioning techniques are used to improve human health and well-being in many areas, including therapy for those recovering from drug addiction and for those overcoming fears. The body's immune system may also respond to classical conditioning.

Multiple-Choice Questions

1. Which of the following is best defined as a relatively permanent change in behavior due to experience?
   a. Acquisition
   b. Stimulus
   c. Learning
   d. Habituation
   e. Response

2. Lynn is teaching learning. Every time she claps her hands, Charlie turns off the light. When Randy claps in approval of Lynn's presentation, Charlie does not turn the light off. What concept has Charlie demonstrated?
   a. Habituation
   b. Discrimination
   c. Spontaneous recovery
   d. Extinction
   e. Habituation

3. Classical conditioning is the type of learning in which a person links two or more stimuli and
   a. forgets about them.
   b. lays them out in sequence.
   c. shuts down.
   d. anticipates events.
   e. receives a reward.

4. In classical conditioning, the unconditioned stimulus
   a. naturally triggers a response.
   b. is a naturally occurring response.
   c. is initially irrelevant, and then comes to trigger a response.
   d. objectively studies psychology.
   e. is Pavlovian.

5. Students are accustomed to a bell ringing to indicate the end of a class period. The principal decides to substitute popular music for the bell to indicate the end of each class period. Students quickly respond to the music in the same way they did to the bell. What principle does this illustrate?
   a. Acquisition
   b. Habituation
   c. Generalization
   d. Functional fixedness
   e. Stimulus

6. The work of Ivan Pavlov and John Watson fits best into which of psychology's perspectives?
   a. Humanism
   b. Gestalt psychology
   c. Trait theory
   d. Behaviorism
   e. Neuropsychology

Practice FRQs

1. Carter's goldfish has been classically conditioned to swim to the top of the fish tank every time the light is turned on. This happened because Carter always turns on the light in the room just before feeding the fish. Identify what each of the following would be in this example, making sure you explain why you know your identification is correct.
   - Conditioned response (CR)
   - Conditioned stimulus (CS)
   - Unconditioned stimulus (US)

Answer

1 point: The goldfish swimming to the top of the tank when the light is turned on is the CR because the fish has learned to behave in this way.

1 point: The light is the CS because the goldfish has learned to respond to this stimulus. The light was initially an NS.

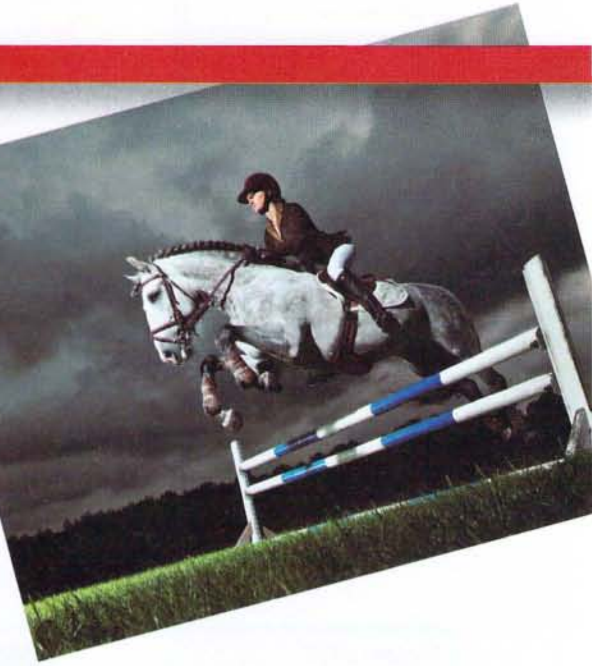
1 point: The food is the US because this stimulus will naturally cause the fish to swim to the top of the tank.

2. A researcher paired the sound of a whistle with an air puff to the eye to classically condition Ashley to blink when the whistle alone was sounded. Explain how the researcher could demonstrate the following:
   - Generalization
   - Extinction
   - Spontaneous recovery

(3 points)

Module 27

Operant Conditioning


Henrik Sorensen

Module Learning Objectives

27-1 Describe operant conditioning, and explain how operant behavior is reinforced and shaped.

27-2 Discuss the differences between positive and negative reinforcement, and identify the basic types of reinforcers.

27-3 Explain how the different reinforcement schedules affect behavior.

27-4 Discuss how punishment and negative reinforcement differ, and explain how punishment affects behavior.

27-5 Describe the controversy over Skinner's views of human behavior.

Operant Conditioning

27-1 What is operant conditioning, and how is operant behavior reinforced and shaped?

It's one thing to classically condition a dog to salivate at the sound of a tone, or a child to fear moving cars. To teach an elephant to walk on its hind legs or a child to say *please,* we turn to operant conditioning.

Classical conditioning and operant conditioning are both forms of associative learning, yet their difference is straightforward:

- *Classical conditioning* forms associations between stimuli (a CS and the US it signals). It also involves *respondent behavior*—actions that are automatic responses to a stimulus (such as salivating in response to meat powder and later in response to a tone).
- In **operant conditioning,** organisms associate their own actions with consequences. Actions followed by reinforcers increase; those followed by punishers often decrease. Behavior that *operates* on the environment to *produce* rewarding or punishing stimuli is called *operant behavior.*

AP® Exam Tip

Don't be fooled by the fact that classical conditioning is presented before operant conditioning. Classical conditioning was understood before operant conditioning, but operant conditioning has a larger impact on our day-to-day lives.

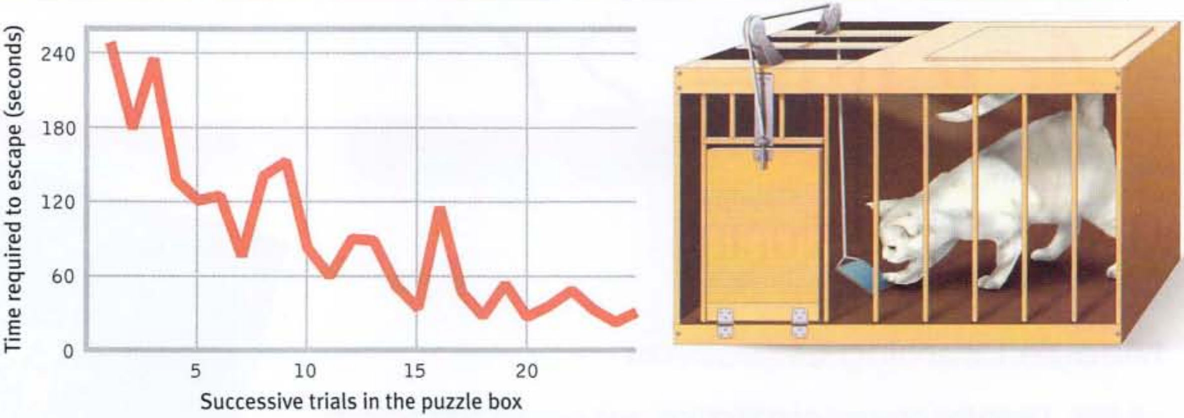
operant conditioning a type of learning in which behavior is strengthened if followed by a reinforcer or diminished if followed by a punisher.

law of effect Thorndike's principle that behaviors followed by favorable consequences become more likely, and that behaviors followed by unfavorable consequences become less likely.

Skinner's Experiments

B. F. Skinner (1904–1990) was a college English major and an aspiring writer who, seeking a new direction, entered psychology graduate school. He went on to become modern behaviorism's most influential and controversial figure. Skinner's work elaborated on what psychologist Edward L. Thorndike (1874–1949) called the **law of effect:** Rewarded

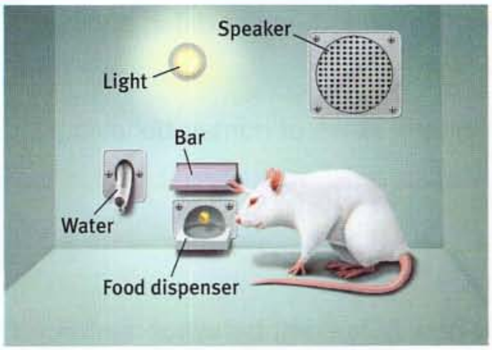
Figure 27.1



Cat in a puzzle box Thorndike used a fish reward to entice cats to find their way out of a puzzle box (right) through a series of maneuvers. The cats' performance tended to improve with successive trials (left), illustrating Thorndike's *law of effect.* (Adapted from Thorndike, 1898.)

behavior is likely to recur (**FIGURE 27.1**). Using Thorndike's law of effect as a starting point, Skinner developed a behavioral technology that revealed principles of *behavior control.* These principles also enabled him to teach pigeons such unpigeon-like behaviors as walking in a figure 8, playing Ping-Pong, and keeping a missile on course by pecking at a screen target.

Figure 27.2



A Skinner box Inside the box, the rat presses a bar for a food reward. Outside, a measuring device (not shown here) records the animal's accumulated responses.

For his pioneering studies, Skinner designed an **operant chamber,** popularly known as a *Skinner box* (**FIGURE 27.2**). The box has a bar (a lever) that an animal presses—or a key (a disc) the animal pecks—to release a reward of food or water. It also has a device that records these responses. This design creates a stage on which rats and others animals act out Skinner's concept of **reinforcement:** any event that strengthens (increases the frequency of) a preceding response. What is reinforcing depends on the animal and the conditions. For people, it may be praise, attention, or a paycheck. For hungry and thirsty rats, food and water work well. Skinner's experiments have done far more than teach us how to pull habits out of a rat. They have explored the precise conditions that foster efficient and enduring learning.

operant chamber in operant conditioning research, a chamber (also known as a *Skinner box*) containing a bar or key that an animal can manipulate to obtain a food or water reinforcer; attached devices record the animal's rate of bar pressing or key pecking.

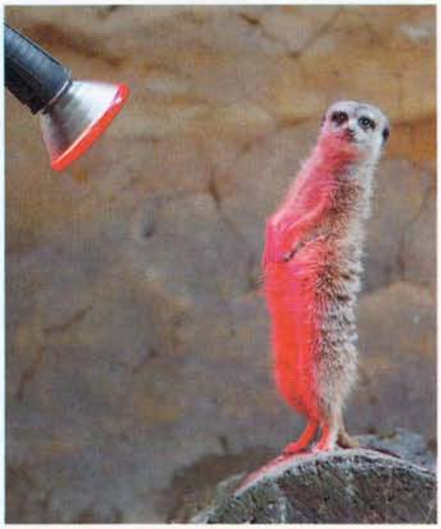
reinforcement in operant conditioning, any event that *strengthens* the behavior it follows.

shaping an operant conditioning procedure in which reinforcers guide behavior toward closer and closer approximations of the desired behavior.

Shaping Behavior

Imagine that you wanted to condition a hungry rat to press a bar. Like Skinner, you could tease out this action with **shaping,** gradually guiding the rat's actions toward the desired behavior. First, you would watch how the animal naturally behaves, so that you could build on its existing behaviors. You might give the rat a bit of food each time it approaches the bar. Once the rat is approaching regularly, you would give the food only when it moves close to the bar, then closer still. Finally, you would require it to touch the bar to get food. With this method of *successive approximations,* you reward responses that are ever-closer to the final desired behavior, and you ignore all other responses. By making rewards contingent on desired behaviors, researchers and animal trainers gradually shape complex behaviors.

Shaping can also help us understand what nonverbal organisms perceive. Can a dog distinguish red and green? Can a baby hear the difference between lower- and higher-pitched tones? If we can shape them to respond to one stimulus and not to another, then we know they can perceive the difference. Such experiments have even shown that some animals can form concepts. When experimenters reinforced pigeons for pecking after



Reuters/CORBIS

Reinforcers vary with circumstances What is reinforcing (a heat lamp) to one animal (a cold meerkat) may not be to another (an overheated child). What is reinforcing in one situation (a cold snap at the Taronga Zoo in Sydney) may not be in another (a sweltering summer day).

seeing a human face, but not after seeing other images, the pigeon's behavior showed that it could recognize human faces (Herrnstein & Loveland, 1964). In this experiment, the human face was a **discriminative stimulus.** Like a green traffic light, discriminative stimuli signal that a response will be reinforced. After being trained to discriminate among classes of events or objects—flowers, people, cars, chairs—pigeons can usually identify the category in which a new pictured object belongs (Bhatt et al., 1988; Wasserman, 1993). They have even been trained to discriminate between the music of Bach and Stravinsky (Porter & Neuringer, 1984).

discriminative stimulus in operant conditioning, a stimulus that elicits a response after association with reinforcement (in contrast to related stimuli not associated with reinforcement).

positive reinforcement increasing behaviors by presenting positive reinforcers. A positive reinforcer is any stimulus that, when *presented* after a response, strengthens the response.

In everyday life, we continually reinforce and shape others' behavior, said Skinner, though we may not mean to do so. Isaac's whining, for example, annoys his dad, but look how he typically responds:

Isaac: Could you take me to the mall?

Father: *(Ignores Isaac and stays focused on his phone)*

Isaac: Dad, I need to go to the mall.

Father: *(distracted)* Uh, yeah, just a minute.

Isaac: DAAAD! The mall!!

Father: Show some manners! Okay, where are my keys. . .

Isaac's whining is reinforced, because he gets something desirable—his dad's attention. Dad's response is reinforced because it gets rid of something aversive—Isaac's whining.

Or consider a teacher who pastes gold stars on a wall chart beside the names of children scoring 100 percent on spelling tests. As everyone can then see, some children consistently do perfect work. The others, who take the same test and may have worked harder than the academic all-stars, get no rewards. The teacher would be better advised to apply the principles of operant conditioning—to reinforce all spellers for gradual improvements (successive approximations toward perfect spelling of words they find challenging).

Shaping a dog to play the piano Using a method of successive approximations, with a food reward for each small step—hopping up on the piano bench, putting her paws on the keys, actually making sounds—this dog was taught to "play" the piano, and now does so frequently!

Antonia Brune, Valentine Photography

Types of Reinforcers

27-2 How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

Up to now, we've mainly been discussing **positive reinforcement,** which strengthens a response by *presenting* a typically pleasurable stimulus after a response. But, as we saw in the whining Isaac story, there are *two* basic kinds of reinforcement (**TABLE 27.1** on the next page).

Table 27.1 Ways to Increase Behavior

Operant Conditioning Term	Description	Examples
Positive reinforcement	Add a desirable stimulus	Pet a dog that comes when you call it; pay the person who paints your house
Negative reinforcement	Remove an aversive stimulus	Take painkillers to end pain; fasten seat belt to end loud beeping

Negative reinforcement *strengthens* a response by *reducing or removing* something negative. Isaac's whining was *positively* reinforced, because Isaac got something desirable—his father's attention. His dad's response to the whining (taking Isaac to the mall) was negatively reinforced, because it ended an aversive event—Isaac's whining. Similarly, taking aspirin may relieve your headache, and pushing the snooze button will silence your annoying alarm. These welcome results provide negative reinforcement and increase the odds that you will repeat these behaviors. For drug addicts, the negative reinforcement of ending withdrawal pangs can be a compelling reason to resume using (Baker et al., 2004). Note that *negative reinforcement is not punishment.* (Some friendly advice: Repeat the last five words in your mind.) Rather, negative reinforcement *removes* a punishing (aversive) event. Think of negative reinforcement as something that provides relief—from that whining teenager, bad headache, or annoying alarm.

Sometimes negative and positive reinforcement coincide. Imagine a worried student who, after goofing off and getting a bad test grade, studies harder for the next test. This increased effort may be *negatively* reinforced by reduced anxiety, and *positively* reinforced by a better grade. Whether it works by reducing something aversive, or by giving something desirable, *reinforcement is any consequence that strengthens behavior.*

HI AND LOIS

negative reinforcement increasing behaviors by stopping or reducing negative stimuli. A negative reinforcer is any stimulus that, when *removed* after a response, strengthens the response. (*Note:* Negative reinforcement is not punishment.)

primary reinforcer an innately reinforcing stimulus, such as one that satisfies a biological need.

conditioned reinforcer a stimulus that gains its reinforcing power through its association with a primary reinforcer; also known as a *secondary reinforcer.*

PRIMARY AND CONDITIONED REINFORCERS

Getting food when hungry or having a painful headache go away is innately satisfying. These **primary reinforcers** are unlearned. **Conditioned reinforcers,** also called *secondary reinforcers,* get their power through learned association with primary reinforcers. If a rat in a Skinner box learns that a light reliably signals a food delivery, the rat will work to turn on the light. The light has become a conditioned reinforcer. Our lives are filled with conditioned reinforcers—money, good grades, a pleasant tone of voice—each of which has been linked with more basic rewards.

IMMEDIATE AND DELAYED REINFORCERS

Let's return to the imaginary shaping experiment in which you were conditioning a rat to press a bar. Before performing this "wanted" behavior, the hungry rat will engage in a sequence of "unwanted" behaviors—scratching, sniffing, and moving around. If you present food immediately after any one of these behaviors, the rat will likely repeat that rewarded behavior. But what if the rat presses the bar while you are distracted, and you delay giving the reinforcer? If the delay lasts longer than about 30 seconds, the rat will not learn to press the bar. You will have reinforced other incidental behaviors—more sniffing and moving—that intervened after the bar press.

Unlike rats, humans do respond to delayed reinforcers: the paycheck at the end of the week, the good grade at the end of the term, the trophy at the end of the season. Indeed, to function effectively we must learn to delay gratification. In laboratory testing, some 4-year-olds show this ability. In choosing a candy, they prefer having a big one tomorrow to munching on a small one right now. Learning to control our impulses in order to achieve more valued rewards is a big step toward maturity (Logue, 1998a,b). No wonder children who make such choices have tended to become socially competent and high-achieving adults (Mischel et al., 1989).

"Oh, not bad. The light comes on, I press the bar, they write me a check. How about you?"

To our detriment, small but immediate consequences (the enjoyment of late-night videos or texting, for example) are sometimes more alluring than big but delayed consequences (feeling alert tomorrow). For many teens, the immediate gratification of risky, unprotected sex in passionate moments prevails over the delayed gratifications of safe sex or saved sex. And for many people, the immediate rewards of today's gas-guzzling vehicles, air travel, and air conditioning prevail over the bigger future consequences of global climate change, rising seas, and extreme weather.

Reinforcement Schedules

27-3 How do different reinforcement schedules affect behavior?

In most of our examples, the desired response has been reinforced every time it occurs. But **reinforcement schedules** vary. With **continuous reinforcement,** learning occurs rapidly, which makes this the best choice for mastering a behavior. But extinction also occurs rapidly. When reinforcement stops—when we stop delivering food after the rat presses the bar—the behavior soon stops. If a normally dependable candy machine fails to deliver a chocolate bar twice in a row, we stop putting money into it (although a week later we may exhibit spontaneous recovery by trying again).

Real life rarely provides continuous reinforcement. Salespeople do not make a sale with every pitch. But they persist because their efforts are occasionally rewarded. This persistence is typical with **partial (intermittent) reinforcement** schedules, in which responses are sometimes reinforced, sometimes not. Learning is slower to appear, but *resistance to extinction* is greater than with continuous reinforcement. Imagine a pigeon that has learned to peck a key to obtain food. If you gradually phase out the food delivery until it occurs only rarely, in no predictable pattern, the pigeon may peck 150,000 times without a reward (Skinner, 1953). Gambling machines and lottery tickets reward gamblers in much the same way—occasionally and unpredictably. And like pigeons, slot players keep trying, time and time again. With intermittent reinforcement, hope springs eternal.

Lesson for child caregivers: Partial reinforcement also works with children. *Occasionally* giving in to children's tantrums for the sake of peace and quiet intermittently reinforces the tantrums. This is the very best procedure for making a behavior persist.

Skinner (1961) and his collaborators compared four schedules of partial reinforcement. Some are rigidly fixed, some unpredictably variable.

Fixed-ratio schedules reinforce behavior after a set number of responses. Coffee shops may reward us with a free drink after every 10 purchased. In the laboratory, rats may be reinforced on a fixed ratio of, say, one food pellet for every 30 responses. Once conditioned, animals will pause only briefly after a reinforcer before returning to a high rate of responding (**FIGURE 27.3** on the next page).

reinforcement schedule a pattern that defines how often a desired response will be reinforced.

continuous reinforcement reinforcing the desired response every time it occurs.

partial (intermittent) reinforcement reinforcing a response only part of the time; results in slower acquisition of a response but much greater resistance to extinction than does continuous reinforcement.

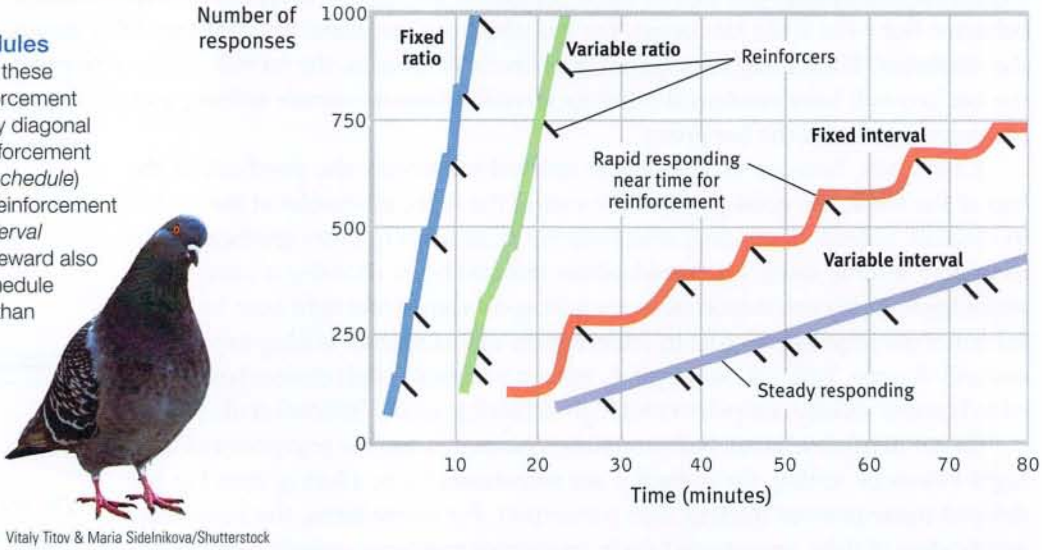
fixed-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified number of responses.

"The charm of fishing is that it is the pursuit of what is elusive but attainable, a perpetual series of occasions for hope." -Scottish author John Buchan (1875–1940)

Figure 27.3

Intermittent reinforcement schedules

Skinner's laboratory pigeons produced these response patterns to each of four reinforcement schedules. (Reinforcers are indicated by diagonal marks.) For people, as for pigeons, reinforcement linked to number of responses (a *ratio schedule*) produces a higher response rate than reinforcement linked to amount of time elapsed (an *interval schedule*). But the predictability of the reward also matters. An unpredictable *(variable)* schedule produces more consistent responding than does a predictable *(fixed)* schedule.



Variable-ratio schedules provide reinforcers after a seemingly unpredictable number of responses. This is what slot-machine players and fly-casting anglers experience—unpredictable reinforcement—and what makes gambling and fly fishing so hard to extinguish even when both are getting nothing for something. Because reinforcers increase as the number of responses increases, variable-ratio schedules produce high rates of responding.

AP® Exam Tip

The word "interval" in schedules of reinforcement means that an interval of time must pass before reinforcement. There is nothing the learner can do to shorten the interval. The word "ratio" refers to the ratio of responses to reinforcements. If the learner responds with greater frequency, there will be more reinforcements.

Fixed-interval schedules reinforce the first response after a fixed time period. Animals on this type of schedule tend to respond more frequently as the anticipated time for reward draws near. People check more frequently for the mail as the delivery time approaches. A hungry child jiggles the Jell-O more often to see if it has set. Pigeons peck keys more rapidly as the time for reinforcement draws nearer. This produces a choppy stop-start pattern rather than a steady rate of response (see Figure 27.3).

Variable-interval schedules reinforce the first response after *varying* time intervals. Like the longed-for responses that finally reward persistence in rechecking e-mail or Facebook, variable-interval schedules tend to produce slow, steady responding. This makes sense, because there is no knowing when the waiting will be over (**TABLE 27.2**).

In general, response rates are higher when reinforcement is linked to the number of responses (a ratio schedule) rather than to time (an interval schedule). But responding is more consistent when reinforcement is unpredictable (a variable schedule) than when it is predictable (a fixed schedule). Animal behaviors differ, yet Skinner (1956) contended

variable-ratio schedule in operant conditioning, a reinforcement schedule that reinforces a response after an unpredictable number of responses.

fixed-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response only after a specified time has elapsed.

variable-interval schedule in operant conditioning, a reinforcement schedule that reinforces a response at unpredictable time intervals.

Table 27.2 Schedules of Reinforcement

	Fixed	Variable
Ratio	*Every so many:* reinforcement after every *nth* behavior, such as buy 10 coffees, get 1 free, or pay per product unit produced	*After an unpredictable number:* reinforcement after a random number of behaviors, as when playing slot machines or fly casting
Interval	*Every so often:* reinforcement for behavior after a fixed time, such as Tuesday discount prices	*Unpredictably often:* reinforcement for behavior after a random amount of time, as in checking for a Facebook response

that the reinforcement principles of operant conditioning are universal. It matters little, he said, what response, what reinforcer, or what species you use. The effect of a given reinforcement schedule is pretty much the same: "Pigeon, rat, monkey, which is which? It doesn't matter. . . . Behavior shows astonishingly similar properties."

Punishment

27-4 How does punishment differ from negative reinforcement, and how does punishment affect behavior?

Reinforcement increases a behavior; **punishment** does the opposite. A *punisher* is any consequence that *decreases* the frequency of a preceding behavior (**TABLE 27.3**). Swift and sure punishers can powerfully restrain unwanted behavior. The rat that is shocked after touching a forbidden object and the child who is burned by touching a hot stove will learn not to repeat those behaviors. A dog that has learned to come running at the sound of an electric can opener will stop coming if its owner runs the machine to attract the dog and banish it to the basement.

Table 27.3 Ways to Decrease Behavior

Type of Punisher	Description	Examples
Positive punishment	Administer an aversive stimulus	Spray water on a barking dog; give a traffic ticket for speeding
Negative punishment	Withdraw a rewarding stimulus	Take away a teen's driving privileges; revoke a library card for nonpayment of fines

Criminal behavior, much of it impulsive, is also influenced more by swift and sure punishers than by the threat of severe sentences (Darley & Alter, 2011). Thus, when Arizona introduced an exceptionally harsh sentence for first-time drunk drivers, the drunk-driving rate changed very little. But when Kansas City police started patrolling a high crime area to increase the sureness and swiftness of punishment, that city's crime rate dropped dramatically.

How should we interpret the punishment studies in relation to parenting practices? Many psychologists and supporters of nonviolent parenting note four major drawbacks of physical punishment (Gershoff, 2002; Marshall, 2002).

1. *Punished behavior is suppressed, not forgotten. This temporary state may (negatively) reinforce parents' punishing behavior.* The child swears, the parent swats, the parent hears no more swearing and feels the punishment successfully stopped the behavior. No wonder spanking is a hit with so many U.S. parents of 3- and 4-year-olds—more than 9 in 10 of whom acknowledged spanking their children (Kazdin & Benjet, 2003).
2. *Punishment teaches discrimination among situations.* In operant conditioning, *discrimination* occurs when an organism learns that certain responses, but not others, will be reinforced. Did the punishment effectively end the child's swearing? Or did the child simply learn that it's not okay to swear around the house, though okay elsewhere?
3. *Punishment can teach fear.* In operant conditioning, *generalization* occurs when an organism's response to similar stimuli is also reinforced. A punished child may associate fear not only with the undesirable behavior but also with the person who delivered the punishment or the place it occurred. Thus, children may learn to fear a punishing teacher and try to avoid school, or may become more anxious (Gershoff et al., 2010). For such reasons, most European countries and most U.S. states now ban

Try This

Telemarketers are reinforced by which schedule? People checking the oven to see if the cookies are done are on which schedule? Airline frequent-flyer programs that offer a free flight after every 25,000 miles of travel use which reinforcement schedule?

ANSWERS: Telemarketers are reinforced on a variable-ratio schedule (after varying numbers of rings). Cookie checkers are reinforced on a fixed-interval schedule. Frequent-flyer programs use a fixed-ratio schedule.

AP® Exam Tip

Remember that *any kind of reinforcement* (positive, negative, primary, conditioned, immediate, delayed, continuous, or partial) encourages the behavior. *Any kind of punishment* discourages the behavior. Positive and negative do not refer to values—it's not that positive reinforcement (or punishment) is the good kind and negative is the bad. Think of positive and negative mathematically; a stimulus is added with positive reinforcement (or punishment) and a stimulus is subtracted with negative reinforcement (or punishment).

punishment an event that tends to *decrease* the behavior that it follows.

David Strickler/The Image Works

Children see, children do? Children who often experience physical punishment tend to display more aggression.

hitting children in schools and child-care institutions (www.stophitting.com). Thirty-three countries, including those in Scandinavia, further outlaw hitting by parents, providing children the same legal protection given to spouses.

4. *Physical punishment may increase aggression by modeling aggression as a way to cope with problems.* Studies find that spanked children are at increased risk for aggression (and depression and low self-esteem). We know, for example, that many aggressive delinquents and abusive parents come from abusive families (Straus & Gelles, 1980; Straus et al., 1997).

Some researchers note a problem. Well, *yes,* they say, physically punished children may be more aggressive, for the same reason that people who have undergone psychotherapy are more likely to suffer depression—because they had preexisting problems that triggered the treatments (Larzelere, 2000, 2004). Which is the chicken and which is the egg? Correlations don't hand us an answer.

If one adjusts for preexisting antisocial behavior, then an occasional single swat or two to misbehaving 2- to 6-year-olds looks more effective (Baumrind et al., 2002; Larzelere & Kuhn, 2005). That is especially so if two other conditions are met:

1. The swat is used only as a backup when milder disciplinary tactics, such as a time-out (removing them from reinforcing surroundings), fail.
2. The swat is combined with a generous dose of reasoning and reinforcing.

Other researchers remain unconvinced. After controlling for prior misbehavior, they report that more frequent spankings of young children predict future aggressiveness (Grogan-Kaylor, 2004; Taylor et al., 2010).

Parents of delinquent youths are often unaware of how to achieve desirable behaviors without screaming at or hitting their children (Patterson et al., 1982). Training programs can help transform dire threats ("Apologize right now or I'm taking that cell phone away!") into positive incentives ("You're welcome to have your phone back when you apologize."). Stop and think about it. Aren't many threats of punishment just as forceful, and perhaps more effective, when rephrased positively? Thus, "If you don't get your homework done, I'm not giving you money for a movie!" would better be phrased as . . . .

In classrooms, too, teachers can give feedback on papers by saying, "No, but try this . . ." and "Yes, that's it!" Such responses reduce unwanted behavior while reinforcing more desirable alternatives. Remember: *Punishment tells you what not to do; reinforcement tells you what to do.*

What punishment often teaches, said Skinner, is how to avoid it. Most psychologists now favor an emphasis on reinforcement.

B. F. Skinner "I am sometimes asked, 'Do you think of yourself as you think of the organisms you study?' The answer is yes. So far as I know, my behavior at any given moment has been nothing more than the product of my genetic endowment, my personal history, and the current setting" (1983).

Skinner's Legacy

27-5 Why did Skinner's ideas provoke controversy?

B. F. Skinner stirred a hornet's nest with his outspoken beliefs. He repeatedly insisted that external influences (not internal thoughts and feelings) shape behavior. And he urged people to use operant principles to influence others' behavior at school, work, and home. Knowing that behavior is shaped by its results, he said we should use rewards to evoke more desirable behavior.

Skinner's critics objected, saying that he dehumanized people by neglecting their personal freedom and by seeking to control their actions. Skinner's reply: External consequences already haphazardly control people's behavior. Why not administer those consequences toward human betterment? Wouldn't reinforcers be more humane than the punishments used in homes, schools, and prisons? And if it is humbling to think that our history has shaped us, doesn't this very idea also give us hope that we can shape our future?

Before You Move On

► ASK YOURSELF

Does your social media behavior (such as checking for new messages) make sense now that you've learned about the different kinds of reinforcement schedules?

► TEST YOURSELF

Fill in the three blanks below with one of the following terms: negative reinforcement (NR), positive punishment (PP), and negative punishment (NP). The first answer, positive reinforcement (PR) is provided for you.

Type of Stimulus	Give It	Take It Away
Desired (for example, a teen's use of the car):	1. PR	2.
Undesired/aversive (for example, an insult):	3.	4.

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 27 Review

27-1 What is operant conditioning, and how is operant behavior reinforced and shaped?

- In *operant conditioning,* behaviors followed by reinforcers increase; those followed by punishers often decrease.
- Expanding on Edward Thorndike's *law of effect,* B. F. Skinner and others found that the behavior of rats or pigeons placed in an *operant chamber* (Skinner box) can be *shaped* by using reinforcers to guide closer and closer approximations of the desired behavior.

27-2 How do positive and negative reinforcement differ, and what are the basic types of reinforcers?

- *Reinforcement* is any consequence that strengthens behavior. *Positive reinforcement* adds a desirable stimulus to increase the frequency of a behavior. *Negative reinforcement* removes an aversive stimulus to increase the frequency of a behavior.
- *Primary reinforcers* (such as receiving food when hungry or having nausea end during an illness) are innately satisfying—no learning is required.
- *Conditioned* (or secondary) *reinforcers* (such as cash) are satisfying because we have learned to associate them with more basic rewards (such as the food or medicine we buy with them).
- Immediate reinforcers (such as a purchased treat) offer immediate payback; delayed reinforcers (such as a weekly paycheck) require the ability to delay gratification.

27-3 How do different reinforcement schedules affect behavior?

- A *reinforcement schedule* defines how often a response will be reinforced.
- In *continuous reinforcement* (reinforcing desired responses every time they occur), learning is rapid, but so is extinction if rewards cease. In *partial (intermittent) reinforcement* (reinforcing responses only sometimes), initial learning is slower, but the behavior is much more resistant to extinction.
- *Fixed-ratio schedules* reinforce behaviors after a set number of responses; *variable-ratio schedules,* after an unpredictable number.
- *Fixed-interval schedules* reinforce behaviors after set time periods; *variable-interval schedules,* after unpredictable time periods.

27-4 How does punishment differ from negative reinforcement, and how does punishment affect behavior?

- *Punishment* administers an undesirable consequence (such as spanking) or withdraws something desirable (such as taking away a favorite toy) in an attempt to decrease the frequency of a behavior (a child's disobedience).
- Negative reinforcement (taking an aspirin) removes an aversive stimulus (a headache). This desired consequence (freedom from pain) increases the likelihood that the behavior (taking aspirin to end pain) will be repeated.
- Punishment can have undesirable side effects, such as suppressing rather than changing unwanted behaviors; teaching aggression; creating fear; encouraging discrimination (so that the undesirable behavior appears when the punisher is not present); and fostering depression and low self-esteem.

27-5 Why did Skinner's ideas provoke controversy?

- Critics of Skinner's principles believed the approach dehumanized people by neglecting their personal freedom and seeking to control their actions. Skinner replied that people's actions are already controlled by external consequences, and that reinforcement is more humane than punishment as a means for controlling behavior.

Multiple-Choice Questions

1. What do we call the kind of learning in which behavior is strengthened if followed by a reinforcer?

a. Operant conditioning
b. Respondent behavior
c. Classical conditioning
d. Shaping
e. Punishment

2. Which of the following best describes a discriminative stimulus?

a. Something that elicits a response after association with a reinforcer
b. An innately reinforcing stimulus
c. Something that when removed increases the likelihood of the behavior
d. An event that decreases the behavior it follows
e. An amplified stimulus feeding back information to responses

3. Thorndike's principle that behaviors followed by favorable consequences become more likely is known as what?

a. Law of effect
b. Operant conditioning
c. Shaping
d. Respondent behavior
e. Discrimination

4. All of the following are examples of primary reinforcers except a

a. rat's food reward in a Skinner box.
b. cold drink on a hot day.
c. high score on an exam for which a student studied diligently.
d. hug from a loved one.
e. large meal following an extended time without food.

Practice FRQs

1. Mom is frustrated because 3-year-old Maya has started to spit frequently. She has decided to temporarily put away one of Maya's toys every time she spits. Mom is going to continue this until Maya has stopped spitting.

- Explain whether Mom's plan uses reinforcement or punishment.
- Explain whether Mom's plan is a positive or negative form of reinforcement or punishment.

Answer

1 point: The plan uses punishment, because it is designed to reduce the frequency of spitting.

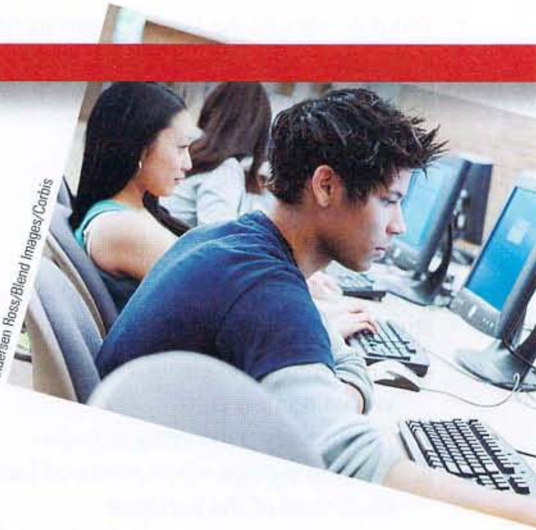
1 point: This is negative punishment because toys are being taken away from Maya.

2. A business owner is considering different compensation plans for her sales force. Identify what schedule of reinforcement is reflected in each of the following plans, making sure you explain why each answer is correct:

- The owner will pay a $1,500 bonus each time a hundred units are sold.
- The owner will have a lottery each month. Each salesperson will get one lottery ticket for every one hundred units sold. The salesperson with the winning ticket will get $5,000.
- The owner will pay each salesperson a monthly salary that does not depend on units sold.

(3 points)

Module 28



Andersen Ross/Blend Images/Corbis

Operant Conditioning's Applications, and Comparison to Classical Conditioning

Module Learning Objectives

28-1 Identify some ways to apply operant conditioning principles at school, in sports, at work, at home, and for self-improvement.

28-2 Identify the characteristics that distinguish operant conditioning from classical conditioning.

FYI

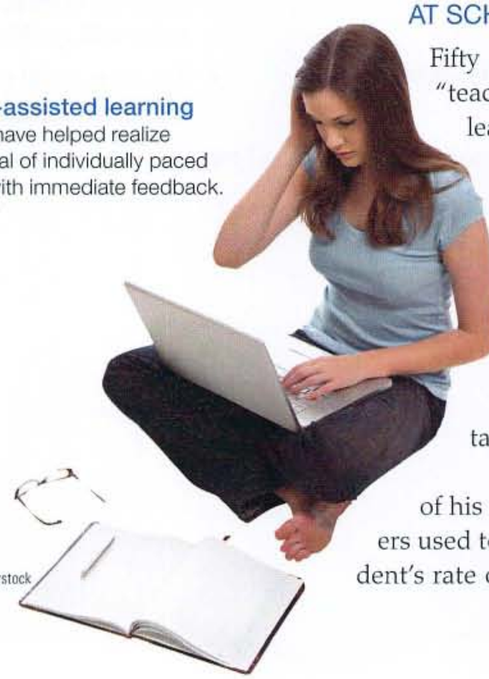
In later units we will see how psychologists apply operant conditioning principles to help people moderate high blood pressure or gain social skills.

Applications of Operant Conditioning

28-1 How might Skinner's operant conditioning principles be applied at school, in sports, at work, at home, and for self-improvement?

Would you like to apply operant conditioning principles to your own life—to be a healthier person, a more successful student, or a high-achieving athlete? Reinforcement technologies are at work in schools, sports, workplaces, and homes, and these principles can support our self-improvement as well (Flora, 2004).

AT SCHOOL



Computer-assisted learning Computers have helped realize Skinner's goal of individually paced instruction with immediate feedback.

Christopher Halloran/Shutterstock

Fifty years ago, Skinner envisioned a day when "teaching machines and textbooks" would shape learning in small steps, immediately reinforcing correct responses. He believed that such machines and texts would revolutionize education and free teachers to focus on each student's special needs. "Good instruction demands two things," Skinner said. "Students must be told immediately whether what they do is right or wrong and, when right, they must be directed to the step to be taken next."

Skinner might be pleased to know that many of his ideals for education are now possible. Teachers used to find it difficult to pace material to each student's rate of learning, and to provide prompt feedback.

Electronic adaptive quizzing does both. Students move through quizzes at their own pace, according to their own level of understanding. And they get immediate feedback on their efforts.

IN SPORTS

The key to shaping behavior in athletic performance, as elsewhere, is first reinforcing small successes and then gradually increasing the challenge. Golf students can learn putting by starting with very short putts, and then, as they build mastery, eventually stepping back farther and farther. Novice batters can begin with half swings at an oversized ball pitched from 10 feet away, giving them the immediate pleasure of smacking the ball. As the hitters' confidence builds with their success and they achieve mastery at each level, the pitcher gradually moves back—to 15, then 22, 30, and 40.5 feet—and eventually introduces a standard baseball. Compared with children taught by conventional methods, those trained by this behavioral method have shown faster skill improvement (Simek & O'Brien, 1981, 1988).

In sports as in the laboratory, the accidental timing of rewards can produce *superstitious behaviors*. If a Skinner box food dispenser gives a pellet of food every 15 minutes, whatever the animal happened to be doing just before the food arrives (perhaps scratching itself) is more likely to be repeated and reinforced, which occasionally can produce a persistent superstitious behavior. Likewise, if a baseball or softball player gets a hit after tapping the plate with the bat, he or she may be more likely to do so again. Over time the player may experience partial reinforcement for what becomes a superstitious behavior.

AT WORK

Knowing that reinforcers influence productivity, many organizations have invited employees to share the risks and rewards of company ownership. Others focus on reinforcing a job well done. Rewards are most likely to increase productivity if the desired performance has been well defined and is achievable. The message for managers? *Reward specific, achievable behaviors, not vaguely defined "merit."*

THE VICE-PRESIDENT IN CHARGE OF SINCERITY

Operant conditioning also reminds us that reinforcement should be *immediate*. IBM legend Thomas Watson understood. When he observed an achievement, he wrote the employee a check on the spot (Peters & Waterman, 1982). But rewards need not be material or lavish. An effective manager may simply walk the floor and sincerely affirm people for good work, or write notes of appreciation for a completed project. As Skinner said, "How much richer would the whole world be if the reinforcers in daily life were more effectively contingent on productive work?"

AT HOME

As we have seen, parents can learn from operant conditioning practices. Parent-training researchers remind us that by saying, "Get ready for bed" but caving in to protests or defiance, parents reinforce such whining and arguing (Wierson & Forehand, 1994). Exasperated, they may then yell or gesture menacingly. When the child, now frightened, obeys, that reinforces the parents' angry behavior. Over time, a destructive parent-child relationship develops.

AP® Exam Tip

Notice how useful operant conditioning is. People with an understanding of the principles of operant conditioning possess a tremendous tool for changing behavior. If you don't like the way your friends, teachers, coaches, or parents behave, pay attention to the uses of operant conditioning!

"I wrote another five hundred words. Can I have another cookie?"

To disrupt this cycle, parents should remember that basic rule of shaping: *Notice people doing something right and affirm them for it.* Give children attention and other reinforcers when they are behaving *well.* Target a specific behavior, reward it, and watch it increase. When children misbehave or are defiant, don't yell at them or hit them. Simply explain the misbehavior and give them a time-out.

FOR SELF-IMPROVEMENT

Finally, we can use operant conditioning in our own lives (see Close-up: Training Our Partners). To build up your *self-control,* you need to reinforce your own desired behaviors (perhaps to exercise more often) and extinguish the undesired ones (to stop texting while studying, for example). Psychologists suggest taking these steps:

1. *State your goal in measurable terms, and announce it.* You might, for example, aim to boost your study time by an hour a day and share that goal with some close friends.
2. *Monitor how often you engage in your desired behavior.* You might log your current study time, noting under what conditions you do and don't study. (When I began writing textbooks, I logged how I spent my time each day and was amazed to discover how much time I was wasting.)
3. *Reinforce the desired behavior.* To increase your study time, give yourself a reward (a snack or some activity you enjoy) only after you finish your extra hour of study. Agree with your friends that you will join them for weekend activities only if you have met your realistic weekly studying goal.

Close-up

Training Our Partners

By Amy Sutherland

For a book I was writing about a school for exotic animal trainers, I started commuting from Maine to California, where I spent my days watching students do the seemingly impossible: teaching hyenas to pirouette on command, cougars to offer their paws for a nail clipping, and baboons to skateboard.

I listened, rapt, as professional trainers explained how they taught dolphins to flip and elephants to paint. Eventually it hit me that the same techniques might work on that stubborn but lovable species, the American husband.

The central lesson I learned from exotic animal trainers is that I should reward behavior I like and ignore behavior I don't. After all, you don't get a sea lion to balance a ball on the end of its nose by nagging. The same goes for the American husband.

Back in Maine, I began thanking Scott if he threw one dirty shirt into the hamper. If he threw in two, I'd kiss him. Meanwhile, I would step over any soiled clothes on the floor without one sharp word, though I did sometimes kick them under the bed. But as he basked in my appreciation, the piles became smaller.

I was using what trainers call "approximations," rewarding the small steps toward learning a whole new behavior. . . . Once I started thinking this way, I couldn't stop. At the school in California, I'd be scribbling notes on how to walk an emu or have a wolf accept you as a pack member, but I'd be thinking, "I can't wait to try this on Scott. . . ."

After two years of exotic animal training, my marriage is far smoother, my husband much easier to love. I used to take his faults personally; his dirty clothes on the floor were an affront, a symbol of how he didn't care enough about me. But thinking of my husband as an exotic species gave me the distance I needed to consider our differences more objectively.

Excerpted with permission from Sutherland, A., (2006, June 25). What Shamu taught me about a happy marriage, *New York Times*.

4. *Reduce the rewards gradually.* As your new behaviors become more habitual, give yourself a mental pat on the back instead of a cookie.

In addition, we can literally learn from ourselves. There is some evidence that when we have feedback about our bodily responses, we can sometimes change those responses. (See Close-up: Biofeedback.)

Close-up

Biofeedback

Knowing the damaging effects of stress, could we train people to counteract stress, bringing their heart rate and blood pressure under conscious control? When a few psychologists started experimenting with this idea, many of their colleagues thought them foolish. After all, these functions are controlled by the autonomic ("involuntary") nervous system. Then, in the late 1960s, experiments by respected psychologists made the skeptics wonder. Neal Miller, for one, found that rats could modify their heartbeat if given pleasurable brain stimulation when their heartbeat increased or decreased. Later research revealed that some paralyzed humans could also learn to control their blood pressure (Miller & Brucker, 1979).

Miller was experimenting with **biofeedback,** a system of recording, amplifying, and feeding back information about subtle physiological responses. Biofeedback instruments mirror the results of a person's own efforts, thereby allowing the person to learn techniques for controlling a particular physiological response (**FIGURE 28.1**). After a decade of study, however, researchers decided the initial claims for biofeedback were overblown and oversold (Miller, 1985). A 1995 National Institutes of Health panel declared that biofeedback works best on tension headaches.

biofeedback a system for electronically recording, amplifying, and feeding back information regarding a subtle physiological state, such as blood pressure or muscle tension.

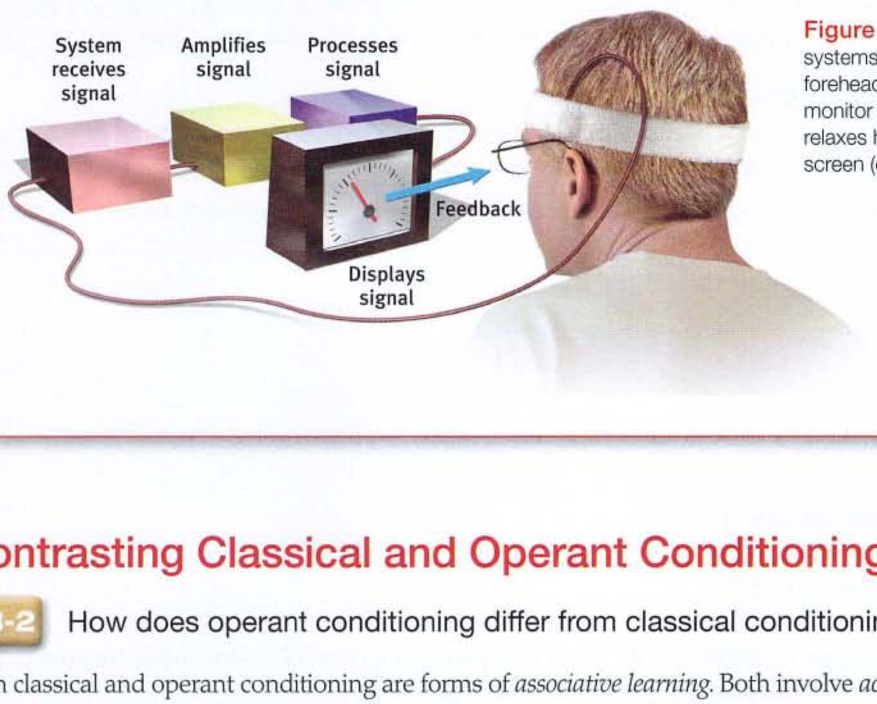


Figure 28.1 Biofeedback systems Biofeedback systems—such as this one, which records tension in the forehead muscle of a headache sufferer—allow people to monitor their subtle physiological responses. As this man relaxes his forehead muscle, the pointer on the display screen (or a tone) may go lower.

Contrasting Classical and Operant Conditioning

28-2 How does operant conditioning differ from classical conditioning?

Both classical and operant conditioning are forms of *associative learning*. Both involve *acquisition, extinction, spontaneous recovery, generalization,* and *discrimination*. But these two forms of learning also differ. Through classical (Pavlovian) conditioning, we associate different stimuli we do not control, and we respond automatically **(respondent behaviors)** (**TABLE 28.1** on the next page). Through operant conditioning, we associate our own behaviors that act on our environment to produce rewarding or punishing stimuli **(operant behaviors)** with their consequences.

As we will see next, our biology and cognitive processes influence both classical and operant conditioning.

respondent behavior behavior that occurs as an automatic response to some stimulus.

operant behavior behavior that operates on the environment, producing consequences.

"O! This learning, what a thing it is." -William Shakespeare, *The Taming of the Shrew*, 1597

Table 28.1 Comparison of Classical and Operant Conditioning

	Classical Conditioning	Operant Conditioning
Basic idea	Organism associates events.	Organism associates behavior and resulting events.
Response	Involuntary, automatic.	Voluntary, operates on environment.
Acquisition	Associating events; NS is paired with US and becomes CS.	Associating response with a consequence (reinforcer or punisher).
Extinction	CR decreases when CS is repeatedly presented alone.	Responding decreases when reinforcement stops.
Spontaneous recovery	The reappearance, after a rest period, of an extinguished CR.	The reappearance, after a rest period, of an extinguished response.
Generalization	The tendency to respond to stimuli similar to the CS.	Organism's response to similar stimuli is also reinforced.
Discrimination	The learned ability to distinguish between a CS and other stimuli that do not signal a US.	Organism learns that certain responses, but not others, will be reinforced.

Before You Move On

▶ ASK YOURSELF

Can you recall a time when a teacher, coach, family member, or employer helped you learn something by shaping your behavior in little steps until you achieved your goal?

▶ TEST YOURSELF

Salivating in response to a tone paired with food is a(n) __________ behavior; pressing a bar to obtain food is a(n) __________ behavior.

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 28 Review

28-1 How might Skinner's operant conditioning principles be applied at school, in sports, at work, at home, and for self-improvement?

- At school, teachers can use shaping techniques to guide students' behaviors, and they can use electronic adaptive quizzing to provide immediate feedback.
- In sports, coaches can build players' skills and self-confidence by rewarding small improvements.
- At work, managers can boost productivity and morale by rewarding well-defined and achievable behaviors.
- At home, parents can reward desired behaviors but not undesirable ones.
- We can shape our own behaviors by stating our goals, monitoring the frequency of desired behaviors, reinforcing desired behaviors, and gradually reducing rewards as behaviors become habitual.

28-2 How does operant conditioning differ from classical conditioning?

- In operant conditioning, an organism learns associations between its own behavior and resulting events; this form of conditioning involves *operant behavior* (behavior that operates on the environment, producing rewarding or punishing consequences).
- In classical conditioning, the organism forms associations between stimuli—events it does not control; this form of conditioning involves *respondent behavior* (automatic responses to some stimulus).

Multiple-Choice Questions

1. What do we call it when the CR decreases as the CS is repeatedly presented alone?

a. Generalization
b. Discrimination
c. Spontaneous recovery
d. Extinction
e. Acquisition

2. The basic idea behind classical conditioning is that the organism

a. associates events.
b. associates behavior and resulting events.
c. voluntarily operates on the environment.
d. associates response with a consequence.
e. quits responding when reward stops.

3. What do we call the reappearance, after a rest period, of an extinguished response?

a. Acquisition
b. Spontaneous recovery
c. Discrimination
d. Operant conditioning
e. Classical conditioning

4. What do we call behavior that occurs as an automatic response to some stimulus?

a. Respondent behavior
b. Operant behavior
c. Extinguished behavior
d. Biofeedback conditioning
e. Skinnerian conditioning

5. Superstitious behavior can be produced by

a. careful manipulation of a classical conditioning experiment.
b. the accidental timing of rewards.
c. possession of a large number of traditionally lucky items.
d. cognitive awareness of superstitious behavior in others.
e. the change in a reinforcement schedule from ratio to interval.

Practice FRQs

1. Explain two differences between classical and operant conditioning.

Answer

Any two differences described in Table 28.1 can be used to answer. Examples include:

1 point: Classical conditioning involves involuntary responses, but operant conditioning involves voluntary responses.

1 point: In classical conditioning, the learner associates two events (a conditioned stimulus with an unconditioned stimulus). In operant conditioning, the learner associates a behavior with a consequence.

2. Raud is planning to use operant conditioning to help him reach his self-improvement goal of running in his community's 10-kilometer race in July. Explain four things Raud should include in his self-improvement plan.

(4 points)

Module 29

Biology, Cognition, and Learning

Module Learning Objectives

29-1 Explain how biological constraints affect classical and operant conditioning.

29-2 Explain how cognitive processes affect classical and operant conditioning.

29-3 Identify the two ways that people learn to cope with personal problems.

29-4 Describe how a perceived lack of control can affect people's behavior and health.

AP® Exam Tip

In the middle of the twentieth century, behaviorism was the dominant perspective in psychology, with little attention paid to the influence of biology and cognition in learning. Now we know better. As you read through this module, notice how important biological and cognitive factors are for understanding learning.

From drooling dogs, running rats, and pecking pigeons we have learned much about the basic processes of learning. But conditioning principles don't tell us the whole story. Today's learning theorists recognize that learning is the product of the interaction of biological, psychological, and social-cultural influences (**FIGURE 29.1**).

Biological Constraints on Conditioning

29-1 How do biological constraints affect classical and operant conditioning?

Ever since Charles Darwin, scientists have assumed that all animals share a common evolutionary history and thus share commonalities in their makeup and functioning. Pavlov and Watson, for example, believed the basic laws of learning were essentially similar in all animals. So it should make little difference whether one studied pigeons or people. Moreover, it seemed that any natural response could be conditioned to any neutral stimulus.

Limits on Classical Conditioning

In 1956, learning researcher Gregory Kimble proclaimed, "Just about any activity of which the organism is capable can be conditioned and . . . these responses can be conditioned to any stimulus that the organism can perceive" (p. 195). Twenty-five years later, he humbly acknowledged that "half a thousand" scientific reports had proven him wrong (Kimble, 1981). More than the early behaviorists realized, an animal's capacity for conditioning is constrained by its biology. Each species' predispositions prepare it to learn the associations that enhance its survival. Environments are not the whole story.

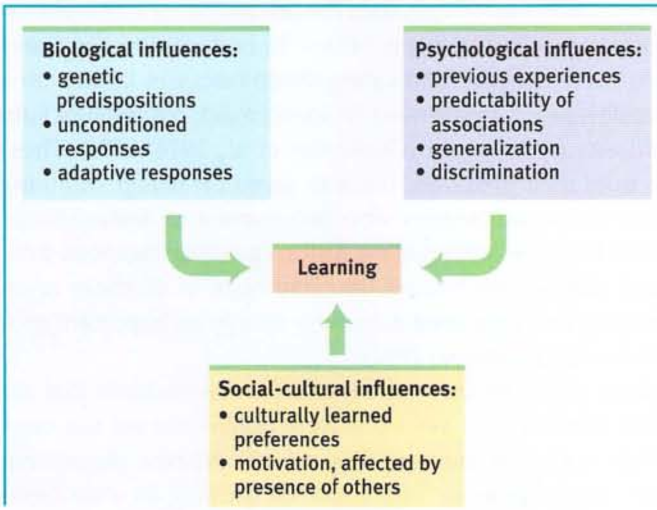


Figure 29.1

Biopsychosocial influences on learning Our learning results not only from environmental experiences, but also from cognitive and biological influences.

John Garcia As the laboring son of California farmworkers, Garcia attended school only in the off-season during his early childhood years. After entering junior college in his late twenties, and earning his Ph.D. in his late forties, he received the American Psychological Association's Distinguished Scientific Contribution Award "for his highly original, pioneering research in conditioning and learning." He was also elected to the National Academy of Sciences.

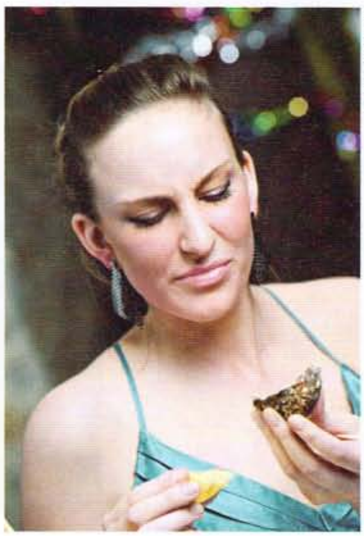
John Garcia was among those who challenged the prevailing idea that all associations can be learned equally well. While researching the effects of radiation on laboratory animals, Garcia and Robert Koelling (1966) noticed that rats began to avoid drinking water from the plastic bottles in radiation chambers. Could classical conditioning be the culprit? Might the rats have linked the plastic-tasting water (a CS) to the sickness (UR) triggered by the radiation (US)?

To test their hunch, Garcia and Koelling exposed the rats to a particular taste, sight, or sound (CS) and later also to radiation or drugs (US) that led to nausea and vomiting (UR). Two startling findings emerged: First, even if sickened as late as several hours after tasting a particular novel flavor, the rats thereafter avoided that flavor. This appeared to violate the notion that for conditioning to occur, the US must immediately follow the CS.

Second, the sickened rats developed aversions to tastes but not to sights or sounds. This contradicted the behaviorists' idea that any perceivable stimulus could serve as a CS. But it made adaptive sense. For rats, the easiest way to identify tainted food is to taste it; if sickened after sampling a new food, they thereafter avoid it. This response, called *taste aversion,* makes it difficult to eradicate a population of "bait-shy" rats by poisoning.

Humans, too, seem biologically prepared to learn some associations rather than others. If you become violently ill four hours after eating contaminated seafood, you will probably develop an aversion to the taste of seafood but usually not to the sight of the associated restaurant, its plates, the people you were with, or the music you heard there. (In contrast, birds, which hunt by sight, appear biologically primed to develop aversions to the *sight* of tainted food [Nicolaus et al., 1983].)

Garcia's early findings on taste aversion were met with an onslaught of criticism. As the German philosopher Arthur Schopenhauer (1788–1860) once said, important ideas are first ridiculed, then attacked, and finally taken for granted. Leading journals refused to publish Garcia's work: The findings are impossible, said some critics. But, as often happens in science, Garcia and Koelling's taste-aversion research is now basic textbook material.



BSIP SA / Alamy

Taste aversion If you became violently ill after eating oysters, you probably would have a hard time eating them again. Their smell and taste would have become a CS for nausea. This learning occurs readily because our biology prepares us to learn taste aversions to toxic foods.

It is also a good example of experiments that begin with the discomfort of some laboratory animals and end by enhancing the welfare of many others. In one conditioned taste-aversion study, coyotes and wolves were tempted into eating sheep carcasses laced with a sickening poison. Thereafter, they developed an aversion to sheep meat; two wolves later penned with a live sheep seemed actually to fear it (Gustavson et al., 1974, 1976). These studies not only saved the sheep from their predators, but also saved the sheep-shunning coyotes and wolves from angry ranchers and farmers who had wanted to destroy them. Similar applications have prevented baboons from raiding African gardens, raccoons from attacking chickens, and ravens and crows from feeding on crane eggs. In all these cases, research helped preserve both the prey and their predators, who occupy an important ecological niche (Dingfelder, 2010; Garcia & Gustavson, 1997).

"All animals are on a voyage through time, navigating toward futures that promote their survival and away from futures that threaten it. Pleasure and pain are the stars by which they steer." -Psychologists Daniel T. Gilbert and Timothy D. Wilson, "Prospection: Experiencing the Future," 2007

Such research supports Darwin's principle that natural selection favors traits that aid survival. Our ancestors who readily learned taste aversions were unlikely to eat the same toxic food again and were more likely to survive and leave descendants. Nausea, like anxiety, pain, and other bad feelings, serves a good purpose. Like a low-oil warning on a car dashboard, each alerts the body to a threat (Neese, 1991).

blickwinkel/Alamy

Animal taste aversion As an alternative to killing wolves and coyotes that preyed on sheep, some ranchers have sickened the animals with lamb laced with a drug.

And remember those Japanese quail that were conditioned to get excited by a red light that signaled a receptive female's arrival? Michael Domjan and his colleagues (2004) report that such conditioning is even speedier, stronger, and more durable when the CS is *ecologically relevant*—something similar to stimuli associated with sexual activity in the natural environment, such as the stuffed head of a female quail. In the real world, observes Domjan (2005), conditioned stimuli have a natural association with the unconditioned stimuli they predict.

The tendency to learn behaviors favored by natural selection may help explain why we humans seem to be naturally disposed to learn associations between the color red and sexuality. Female primates display red when nearing ovulation. In human females, enhanced bloodflow produces the red blush of flirtation and sexual excitation. Does the frequent pairing of red and sex—with Valentine's hearts, red-light districts, and red lipstick—naturally enhance men's attraction to women? Experiments (**FIGURE 29.2**) suggest that, without men's awareness, it does (Elliot & Niesta, 2008). In follow-up studies, men who viewed a supposed female conversation partner in a red rather than green shirt chose to sit closer to where they expected her to sit and to ask her more intimate questions (Kayser et al., 2010). And it's not just men: Women tend to perceive men as more attractive when seen on a red background or in red clothing (Elliot et al., 2010).

Figure 29.2

Romantic red In a series of experiments that controlled for other factors (such as the brightness of the image), men found women more attractive and sexually desirable when framed in red (Elliot & Niesta, 2008).

Both images Kathryn Brownson, Hope College

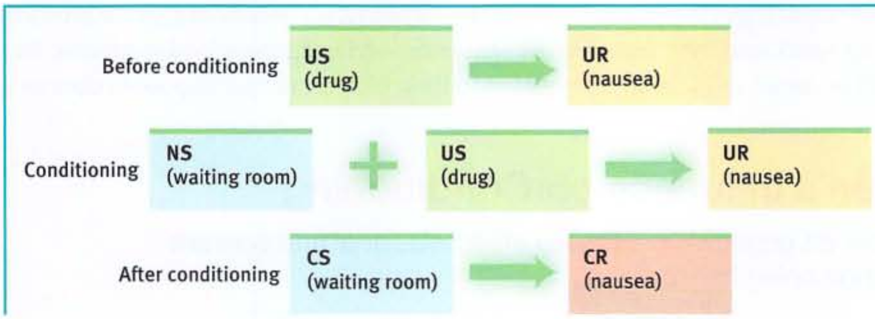


Figure 29.3
Nausea conditioning in cancer patients

A genetic predisposition to associate a CS with a US that follows predictably and immediately is adaptive: Causes often immediately precede effects. Often, but not always, as we saw in the taste-aversion findings. At such times, our predispositions can trick us. When chemotherapy triggers nausea and vomiting more than an hour following treatment, cancer patients may over time develop classically conditioned nausea (and sometimes anxiety) to the sights, sounds, and smells associated with the clinic (**FIGURE 29.3**) (Hall, 1997). Merely returning to the clinic's waiting room or seeing the nurses can provoke these conditioned feelings (Burish & Carey, 1986; Davey, 1992). Under normal circumstances, such revulsion to sickening stimuli would be adaptive.

"Once bitten, twice shy." -G. F. NORTHALL, *FOLK-PHRASES,* 1894

Limits on Operant Conditioning

As with classical conditioning, nature sets limits on each species' capacity for operant conditioning. Mark Twain (1835–1910) said it well: "Never try to teach a pig to sing. It wastes your time and annoys the pig."

We most easily learn and retain behaviors that reflect our biological predispositions. Thus, using food as a reinforcer, you could easily condition a hamster to dig or to rear up, because these are among the animal's natural food-searching behaviors. But you won't be so successful if you use food as a reinforcer to shape face washing and other hamster behaviors that aren't normally associated with food or hunger (Shettleworth, 1973). Similarly, you could easily teach pigeons to flap their wings to avoid being shocked, and to peck to obtain food: Fleeing with their wings and eating with their beaks are natural pigeon behaviors. However, pigeons would have a hard time learning to peck to avoid a shock, or to flap their wings to obtain food (Foree & LoLordo, 1973). The principle: *Biological constraints predispose organisms to learn associations that are naturally adaptive.*

Natural athletes Animals can most easily learn and retain behaviors that draw on their biological predispositions, such as horses' inborn ability to move around obstacles with speed and agility.

AP Photo/The Gallup Independent, Jeffery Jones

In the early 1940s, University of Minnesota graduate students Marian Breland and Keller Breland witnessed the power of operant conditioning (1961; Bailey & Gillaspy, 2005). Their mentor was B. F. Skinner. Impressed with his results, they began training dogs, cats, chickens, parakeets, turkeys, pigs, ducks, and hamsters. The rest is history. The company they formed spent the next half-century training more than 15,000 animals from 140 species for movies, traveling shows, amusement parks, corporations, and the government. And along the way, the Brelands themselves mentored others, including Sea World's first director of training.

In their early training days, the Brelands presumed that operant principles would work on almost any response an animal could make. But along the way, they too learned about biological constraints. In one act, pigs trained to pick up large wooden "dollars" and deposit them in a piggy bank began to drift back

FYI

For more information on animal behavior, see books by (I am not making this up) Robin Fox and Lionel Tiger.

to their natural ways. They dropped the coin, pushed it with their snouts as pigs are prone to do, picked it up again, and then repeated the sequence—delaying their food reinforcer. This *instinctive drift* occurred as the animals reverted to their biologically predisposed patterns.

Cognition's Influence on Conditioning

29-2 How do cognitive processes affect classical and operant conditioning?

Cognitive Processes and Classical Conditioning

In their dismissal of "mentalistic" concepts such as consciousness, Pavlov and Watson underestimated the importance not only of biological constraints on an organism's learning capacity, but also the effects of cognitive processes (thoughts, perceptions, expectations). The early behaviorists believed that rats' and dogs' learned behaviors could be reduced to mindless mechanisms, so there was no need to consider cognition. But Robert Rescorla and Allan Wagner (1972) showed that an animal can learn the *predictability* of an event. If a shock always is preceded by a tone, and then may also be preceded by a light that accompanies the tone, a rat will react with fear to the tone but not to the light. Although the light is always followed by the shock, it adds no new information; the tone is a better predictor. The more predictable the association, the stronger the conditioned response. It's as if the animal learns an *expectancy,* an awareness of how likely it is that the US will occur.

"All brains are, in essence, anticipation machines." -Daniel C. Dennett, *Consciousness Explained,* 1991

Associations can influence attitudes (Hofmann et al., 2010). When British children viewed novel cartoon characters alongside either ice cream *(Yum!)* or brussels sprouts *(Yuck!)*, they came to like best the ice-cream-associated characters (Field, 2006). Other researchers have classically conditioned adults' attitudes, using little-known Pokémon characters (Olson & Fazio, 2001). The participants, playing the role of a security guard monitoring a video screen, viewed a stream of words, images, and Pokémon characters. Their task, they were told, was to respond to one target Pokémon character by pressing a button. Unnoticed by the participants, when two other Pokémon characters appeared on the screen, one was consistently associated with various positive words and images (such as *awesome* or a hot fudge sundae); the other appeared with negative words and images (such as *awful* or a cockroach). Without any conscious memory for the pairings, the participants formed more gut-level liking for the characters associated with the positive stimuli.

Follow-up studies indicate that conditioned likes and dislikes are even stronger when people notice and are aware of the associations they have learned (Shanks, 2010). Cognition matters.

Such experiments help explain why classical conditioning treatments that ignore cognition often have limited success. For example, people receiving therapy for alcohol use disorder may be given alcohol spiked with a nauseating drug. Will they then associate alcohol with sickness? If classical conditioning were merely a matter of "stamping in" stimulus associations, we might hope so, and to some extent this does occur (as we will see in Module 71). However, one's awareness that the nausea is induced by the drug, not the alcohol, often weakens the association between drinking alcohol and feeling sick. So, even in classical conditioning, it is (especially with humans) not simply the CS-US association but also the thought that counts.

Cognitive Processes and Operant Conditioning

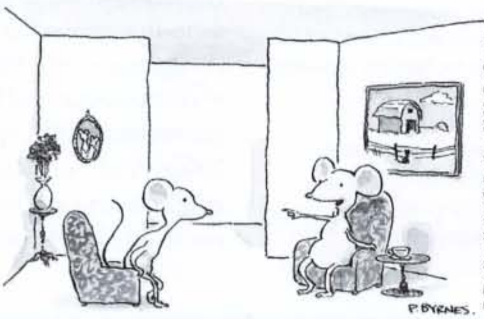
B. F. Skinner acknowledged the biological underpinnings of behavior and the existence of private thought processes. Nevertheless, many psychologists criticized him for discounting the importance of these influences.

A mere eight days before dying of leukemia in 1990, Skinner stood before the American Psychological Association convention. In this final address, he again resisted the growing belief that cognitive processes (thoughts, perceptions, expectations) have a necessary place in the science of psychology and even in our understanding of conditioning. He viewed "cognitive science" as a throwback to early twentieth-century introspectionism. For Skinner, thoughts and emotions were behaviors that follow the same laws as other behaviors.

Nevertheless, the evidence of cognitive processes cannot be ignored. For example, animals on a fixed-interval reinforcement schedule respond more and more frequently as the time approaches when a response will produce a reinforcer. Although a strict behaviorist would object to talk of "expectations," the animals behave as if they expected that repeating the response would soon produce the reward.

LATENT LEARNING

Evidence of cognitive processes has also come from studying rats in mazes, including classic studies by Edward Chase Tolman (1886–1959) and C. H. Honzik that were done in Skinner's youth. Rats exploring a maze, given no obvious rewards, seem to develop a **cognitive map,** a mental representation of the maze, much like your mental map of your school. This map, and the rats' learning, is not demonstrated until the experimenter places food in the maze's goal box, which motivates the rats to run the maze at least as quickly and efficiently as other rats that were previously reinforced with food for this result (Tolman & Honzik, 1930).



"Bathroom? Sure, it's just down the hall to the left, jog right, left, another left, straight past two more lefts, then right, and it's at the end of the third corridor on your right."

Like people sightseeing in a new town, the exploring rats seemingly experienced **latent learning** during their earlier tours. That learning became apparent only when there was some incentive to demonstrate it. Children, too, may learn from watching a parent but demonstrate the learning only much later, as needed. The point to remember: *There is more to learning than associating a response with a consequence; there is also cognition.* In Unit VII we will encounter more striking evidence of cognitive abilities in solving problems and in using language.

INSIGHT LEARNING

Some learning occurs after little or no systematic interaction with our environment. For example, we may puzzle over a problem, and suddenly, the pieces fall together as we perceive the solution in a sudden flash of **insight**—an abrupt, true-seeming, and often satisfying solution (Topolinski & Reber, 2010). Ten-year-old Johnny Appleton's insight solved a problem that had stumped construction workers: how to rescue a young robin that had fallen into a narrow 30-inch-deep hole in a cement-block wall. Johnny's solution: Slowly pour in sand, giving the bird enough time to keep its feet on top of the constantly rising pile (Ruchlis, 1990).

INTRINSIC MOTIVATION

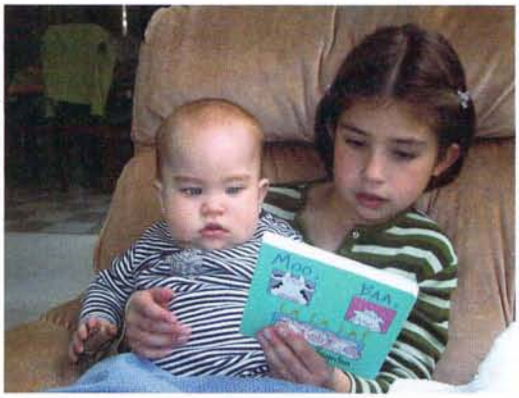
The cognitive perspective has also shown us the limits of rewards: Promising people a reward for a task they already enjoy can backfire. Excessive rewards can destroy **intrinsic motivation**—the desire to perform a behavior effectively for its own sake. In experiments, children have been promised a payoff for playing with an interesting puzzle or toy. Later, they played with the toy *less* than other unpaid children did (Deci et al., 1999; Tang & Hall, 1995). Likewise, rewarding children with toys or candy for reading diminishes the time they spend reading (Marinak & Gambrell, 2008). It is as if they think, "If I have to be bribed into doing this, it must not be worth doing for its own sake." This overuse of bribes—leading people to see their actions as externally controlled rather than internally appealing—has been called *overjustification.*

cognitive map a mental representation of the layout of one's environment. For example, after exploring a maze, rats act as if they have learned a cognitive map of it.

latent learning learning that occurs but is not apparent until there is an incentive to demonstrate it.

insight a sudden realization of a problem's solution.

intrinsic motivation a desire to perform a behavior effectively for its own sake.



Courtesy Christine Brune

Pure love If this girl were suddenly told that she must look after her baby cousin from now on, she might lose some of the joy that her intrinsic motivation to care for him has provided.

extrinsic motivation a desire to perform a behavior to receive promised rewards or avoid threatened punishment.

To sense the difference between intrinsic motivation and **extrinsic motivation** (behaving in certain ways to gain external rewards or avoid threatened punishment), think about your experience in this course. Are you feeling pressured to finish this reading before a deadline? Worried about your grade? Eager for college credit by doing well on the AP® Exam? If *Yes,* then you are extrinsically motivated (as, to some extent, almost all students must be). Are you also finding the material interesting? Does learning it make you feel more competent? If there were no grade at stake, might you be curious enough to want to learn the material for its own sake? If *Yes,* intrinsic motivation also fuels your efforts.

Youth sports coaches who aim to promote enduring interest in an activity, not just to pressure players into winning, should focus on the intrinsic joy of playing and of reaching one's potential (Deci & Ryan, 1985, 2009). Giving people choices also enhances their intrinsic motivation (Patall et al., 2008). Nevertheless, rewards used to signal a job well done (rather than to bribe or control someone) can be effective (Boggiano et al., 1985). "Most improved player" awards, for example, can boost feelings of competence and increase enjoyment of a sport. Rightly administered, rewards can raise performance and spark creativity (Eisenberger & Aselage, 2009; Henderlong & Lepper, 2002). And extrinsic rewards (such as the college scholarships and jobs that often follow good grades) are here to stay. **TABLE 29.1** compares the biological and cognitive influences on classical and operant conditioning.

Table 29.1 Biological and Cognitive Influences on Conditioning

	Classical Conditioning	Operant Conditioning
Biological predispositions	Natural predispositions constrain what stimuli and responses can easily be associated.	Organisms best learn behaviors similar to their natural behaviors; unnatural behaviors instinctively drift back toward natural ones.
Cognitive processes	Organisms develop expectation that CS signals the arrival of US.	Organisms develop expectation that a response will be reinforced or punished; they also exhibit latent learning, without reinforcement.

Learning and Personal Control

29-3 In what two ways do people learn to cope with personal problems?

coping alleviating stress using emotional, cognitive, or behavioral methods.

problem-focused coping attempting to alleviate stress directly—by changing the stressor or the way we interact with that stressor.

emotion-focused coping attempting to alleviate stress by avoiding or ignoring a stressor and attending to emotional needs related to one's stress reaction.

Problems in life are unavoidable. This fact gives us a clear message: We need to learn to **cope** with the problems in our lives by alleviating the *stress* they cause with emotional, cognitive, or behavioral methods.

Some problems, called stressors, we address directly, with **problem-focused coping.** If our impatience leads to a family fight, we may go directly to that family member to work things out. We tend to use problem-focused strategies when we feel a sense of control over a situation and think we can change the circumstances, or at least change ourselves to deal with the circumstances more capably.

We turn to **emotion-focused coping** when we cannot—or *believe* we cannot—change a situation. If, despite our best efforts, we cannot get along with that family member, we may search for stress relief by reaching out to friends for support and comfort. Emotion-focused strategies can be adaptive, as when we exercise or keep busy with hobbies to avoid thinking about an old addiction. Emotion-focused strategies can be maladaptive, however, as when

Huntstock, Inc/Alamy

Emotion-focused coping Reaching out to friends can help us attend to our emotional needs in stressful situations.

students worried about not keeping up with the reading in class go out to party to get it off their mind. Sometimes a problem-focused strategy (catching up with the reading) more effectively reduces stress and promotes long-term health and satisfaction.

When challenged, some of us tend to respond with cool problem-focused coping, others with emotion-focused coping (Connor-Smith & Flachsbart, 2007). Our feelings of personal control, our explanatory style, and our supportive connections all influence our ability to cope. So, how might learning influence whether we cope successfully?

Learned Helplessness

29-4 How does a perceived lack of control affect people's behavior and health?

Picture the scene: Two rats receive simultaneous shocks. One can turn a wheel to stop the shocks. The helpless rat, but not the wheel turner, becomes more susceptible to ulcers and lowered immunity to disease (Laudenslager & Reite, 1984). In humans, too, uncontrollable threats trigger the strongest stress responses (Dickerson & Kemeny, 2004).

Feeling helpless and oppressed may lead to a state of passive resignation called **learned helplessness** (**FIGURE 29.4**). Researcher Martin Seligman (1975, 1991) discovered this in some long-ago experiments in which dogs were strapped in a harness and given repeated shocks, with no opportunity to avoid them. Later, when placed in another situation where they *could* escape the punishment by simply leaping a hurdle, the dogs cowered as if without hope. In contrast, animals able to escape the first shocks learned personal control and easily escaped the shocks in the new situation.

learned helplessness the hopelessness and passive resignation an animal or human learns when unable to avoid repeated aversive events.

Humans can also learn helplessness. When repeatedly faced with traumatic events over which they have no control, people come to feel helpless, hopeless, and depressed.

Perceiving a loss of control, we become more vulnerable to stress and ill health. A famous study of elderly nursing home residents with little perceived control over their activities found that they declined faster and died sooner than those given more control (Rodin, 1986). Workers able to adjust office furnishings and control interruptions and distractions in their work environment have experienced

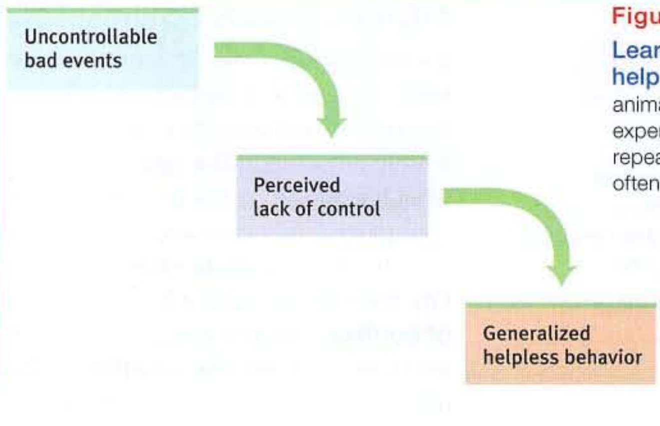


Figure 29.4 **Learned helplessness** When animals and people experience no control over repeated bad events, they often learn helplessness.

PRNewsFoto/Home Interiors & Gifts; Habitat for Humanity Women Build

Happy to have control After working on the building—alongside Habitat for Humanity volunteers—for several months, this family is finally experiencing the joy of having their own new home.

less stress (O'Neill, 1993). Such findings may help explain why British civil service workers at the executive grades have tended to outlive those at clerical or laboring grades, and why Finnish workers with low job stress have been less than half as likely to die of strokes or heart disease as those with a demanding job and little control. The more control workers have, the longer they live (Bosma et al., 1997, 1998; Kivimaki et al., 2002; Marmot et al., 1997).

Increasing self-control—allowing prisoners to move chairs and control room lights and the TV, having workers participate in decision making, offering nursing home patients choices about their environment—noticeably improves health and morale (Humphrey et al., 2007; Wang et al., 2010). In the case of the nursing home patients, 93 percent of those encouraged to exert more control became more alert, active, and happy (Rodin, 1986). As researcher Ellen Langer (1983, p. 291) concluded, "Perceived control is basic to human functioning."

Control may also help explain a well-established link between economic status and longevity (Jokela et al., 2009). In one study of 843 grave markers in an old graveyard in Glasgow, Scotland, those with the costliest, highest pillars (indicating the most affluence) tended to have lived the longest (Carroll et al., 1994). Likewise, those living in Scottish regions with the least overcrowding and unemployment have the greatest longevity. There and elsewhere, high economic status predicts a lower risk of heart and respiratory diseases (Sapolsky, 2005). Wealthy predicts healthy among children, too (Chen, 2004). With higher economic status come reduced risks of low birth weight, infant mortality, smoking, and violence. Even among other primates, individuals at the bottom of the social pecking order have been more likely than their higher-status companions to become sick when exposed to a cold-like virus (Cohen et al., 1997). But high status also entails stress: High-status baboons and monkeys who frequently have to physically defend their dominant position show high stress levels (Sapolsky, 2005).

Why does perceived loss of control predict health problems? Because losing control provokes an outpouring of stress hormones. When rats cannot control shock or when primates or humans feel unable to control their environment, stress hormone levels rise, blood pressure increases, and immune responses drop (Rodin, 1986; Sapolsky, 2005). Captive animals therefore experience more stress and are more vulnerable to disease than are wild animals (Roberts, 1988). Human studies have confirmed that crowding in high-density neighborhoods, prisons, and college and university dorms is another source of diminished feelings of control—and of elevated levels of stress hormones and blood pressure (Fleming et al., 1987; Ostfeld et al., 1987).

INTERNAL VERSUS EXTERNAL LOCUS OF CONTROL

If experiencing a loss of control can be stressful and unhealthy, do people who generally feel in control of their lives enjoy better health? Consider your own feelings of control. Do you believe that your life is beyond your control? That getting a decent summer job depends mainly on being in the right place at the right time? Or do you more strongly believe that what happens to you is your own doing? That being a success is a matter of hard work? Did your parents influence your feelings of control? Did your culture?

external locus of control the perception that chance or outside forces beyond our personal control determine our fate.

internal locus of control the perception that you control your own fate.

Hundreds of studies have compared people who differ in their perceptions of control. On one side are those who have what psychologist Julian Rotter called an **external locus of control**—the perception that chance or outside forces determine their fate. On the other are those who perceive an **internal locus of control,** who believe that they control their own destiny. In study after study, "internals" have achieved more in school and work, acted more independently, enjoyed better health, and felt less depressed than did "externals" (Lefcourt, 1982; Ng et al., 2006). Moreover, they were better at delaying gratification and coping with various stressors, including marital problems (Miller & Monge, 1986). One study followed 7551 British people for two decades. Those who expressed a more internal locus of control at age 10 exhibited less obesity, hypertension, and distress at age 30 (Gale et al., 2008). Other studies have found that people who believe in free will, or that willpower is controllable, learn better, perform better at work, and are more helpful (Job et al., 2010; Stillman et al., 2010).

Compared with their parents' generation, more Americans now endorse an external locus of control (Twenge et al., 2004). This shift may help explain an associated increase in rates of depression and other psychological disorders in the new generation (Twenge et al., 2010).

DEPLETING AND STRENGTHENING SELF-CONTROL

Self-control is the ability to control impulses and delay short-term gratification for longer-term rewards. In studies, this ability has predicted good adjustment, better grades, and social success (Tangney et al., 2004). Students who planned their day's activities and then lived out their day as planned were also at low risk for depression (Nezlek, 2001).

self-control the ability to control impulses and delay short-term gratification for greater long-term rewards.

Self-control often fluctuates. Like a muscle, self-control temporarily weakens after an exertion, replenishes with rest, and becomes stronger with exercise (Baumeister & Exline, 2000; Hagger et al., 2010; Vohs & Baumeister, 2011). Exercising willpower temporarily depletes the mental energy needed for self-control on other tasks (Gailliott & Baumeister, 2007). In one experiment, hungry people who had resisted the temptation to eat chocolate chip cookies abandoned a tedious task sooner than those who had not resisted the cookies. And after expending willpower on laboratory tasks, such as stifling prejudice or saying the color of words (for example, "red" even if the red-colored word was *green*), people were less restrained in their aggressive responses to provocation and in their sexuality (DeWall et al., 2007; Gaillot & Baumeister, 2007).

LatitudeStock/Brian Fairbrother/Getty Images

AP Photo/Marty Lederhandler

Extreme self-control Our ability to exert self-control increases with practice, and some of us have practiced more than others! Magician David Blaine (above) endured standing in a block of ice (in which a small space had been carved out for him) for nearly 62 hours for a stunt in New York's Times Square. A number of performing artists make their living as very convincing human statues, as does this actress (left) performing on The Royal Mile in Edinburgh, Scotland.

Researchers have found that exercising willpower depletes the blood sugar and neural activity associated with mental focus (Inzlicht & Gutsell, 2007). What, then, might be the effect of deliberately boosting people's blood sugar when self-control is depleted? Giving energy-boosting sugar (in a naturally rather than an artificially sweetened lemonade) had a sweet effect: It strengthened people's effortful thinking and reduced their financial impulsiveness (Masicampo & Baumeister, 2008; Wang & Dvorak, 2010). Even dogs can experience both self-control depletion on the one hand and rejuvenation with sugar on the other (Miller et al., 2010).

In the long run, self-control requires attention and energy. With physical exercise and time-managed study programs, people have strengthened their self-control, as seen in both their performance on laboratory tasks and their improved self-management of eating, drinking, smoking, and household chores (Oaten & Cheng, 2006a,b). *The bottom line:* We can grow our willpower muscles—our capacity for self-regulation. But doing so requires some (dare I say it?) willpower.

Before You Move On

► ASK YOURSELF

How are you intrinsically motivated? What are some extrinsic motivators in your life?

► TEST YOURSELF

When faced with a situation over which you feel you have no sense of control, is it most effective to use emotion- or problem-focused coping? Why?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 29 Review

29-1 How do biological constraints affect classical and operant conditioning?

- Classical conditioning principles, we now know, are constrained by biological predispositions, so that learning some associations is easier than learning others.
- Learning is adaptive: Each species learns behaviors that aid its survival.
- Biological constraints also place limits on operant conditioning. Training that attempts to override biological constraints will probably not endure because animals will revert to predisposed patterns.

29-2 How do cognitive processes affect classical and operant conditioning?

- In classical conditioning, animals may learn when to expect a US and may be aware of the link between stimuli and responses.
- In operant conditioning, *cognitive mapping* and *latent learning* research demonstrate the importance of cognitive processes in learning.
- Other research shows that excessive rewards (driving *extrinsic motivation*) can undermine *intrinsic motivation.*

29-3 In what two ways do people learn to cope with personal problems?

- We use *problem-focused coping* to change the stressor or the way we interact with it.
- We use *emotion-focused coping* to avoid or ignore stressors and attend to emotional needs related to stress reactions.

29-4 How does a perceived lack of control affect people's behavior and health?

- Being unable to avoid repeated aversive events can lead to *learned helplessness*.
- People who perceive an *internal locus of control* achieve more, enjoy better health, and are happier than those who perceive an *external locus of control*.
- *Self-control* requires attention and energy, but it predicts good adjustment, better grades, and social success.
- A perceived lack of control provokes an outpouring of hormones that put people's health at risk.

Multiple-Choice Questions

1. What do we call a desire to perform a behavior in order to receive promised rewards or to avoid threatened punishment?

a. Latent learning
b. Extrinsic motivation
c. Intrinsic motivation
d. Insight learning
e. Emotion-focused coping

2. Which ability is a good predictor of good adjustment, better grades, and social success?

a. Self-control
b. Locus of control
c. Problem-focused coping
d. Learned helplessness
e. Emotion-focused coping

3. Elephants appear to have the capacity to remember large-scale spaces over long periods. Which of the following best identifies this capacity?

a. Latent learning
b. Insight
c. Cognitive maps
d. Intrinsic motivation
e. Extrinsic motivation

4. The perception that we control our own fate is also called what?

a. Self-control
b. Learned helplessness
c. Internal locus of control
d. External locus of control
e. Emotion-focused coping

5. A woman had been pondering a problem for days and was about to give up when, suddenly, the solution came to her. Her experience can be best described as what?

a. Cognitive mapping
b. Insight
c. Operant conditioning
d. Classical conditioning
e. Unconscious associative learning

Practice FRQs

1. Provide two specific examples of how biology can influence classical conditioning.

Answer

Any two examples from the module can be used to answer. Possibilities include:

1 point: Garcia's research showed that rats are more likely to develop a classically conditioned aversion to tastes than to sights or sounds.

1 point: Humans are biologically predisposed to form associations between the color red and sexuality.

2. Describe how each of the following can show the impact of cognition on operant conditioning.

- Latent learning
- Insight learning
- Intrinsic motivation

(3 points)

Module 30

Learning by Observation

Module Learning Objectives

30-1 Describe the process of observational learning, and explain how some scientists believe it is enabled by mirror neurons.

30-2 Discuss the impact of prosocial modeling and of antisocial modeling.

30-1 What is observational learning, and how do some scientists believe it is enabled by mirror neurons?

observational learning learning by observing others. Also called *social learning.*

modeling the process of observing and imitating a specific behavior.

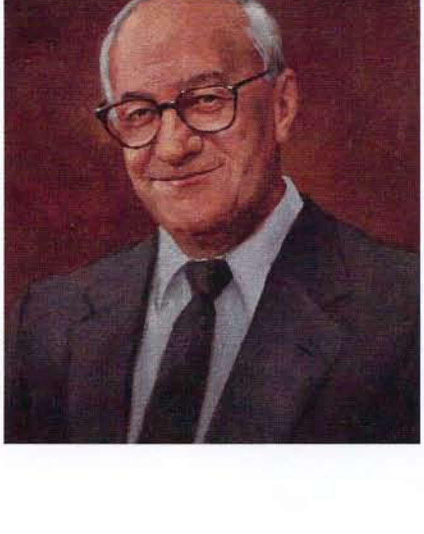
Cognition is certainly a factor in **observational learning** (also called *social learning*) in which higher animals, especially humans, learn without direct experience, by watching and imitating others. A child who sees his sister burn her fingers on a hot stove learns not to touch it. We learn our native languages and various other specific behaviors by observing and imitating others, a process called **modeling.**

Picture this scene from an experiment by Albert Bandura, the pioneering researcher of observational learning (Bandura et al., 1961): A preschool child works on a drawing. An adult in another part of the room is building with Tinkertoys. As the child watches, the adult gets up and for nearly 10 minutes pounds, kicks, and throws around the room a large inflated Bobo doll, yelling, "Sock him in the nose. . . . Hit him down. . . . Kick him."

AP® Exam Tip

Bandura's Bobo doll experiment is one of the most famous in psychology. It shows up frequently on the AP® exam.

The child is then taken to another room filled with appealing toys. Soon the experimenter returns and tells the child she has decided to save these good toys "for the other children." She takes the now-frustrated child to a third room containing a few toys, including a Bobo doll. Left alone, what does the child do?



Albert Bandura "The Bobo doll follows me wherever I go. The photographs are published in every introductory psychology text and virtually every undergraduate takes introductory psychology. I recently checked into a Washington hotel. The clerk at the desk asked, 'Aren't you the psychologist who did the Bobo doll experiment?' I answered, 'I am afraid that will be my legacy.' He replied, 'That deserves an upgrade. I will put you in a suite in the quiet part of the hotel'" (2005).

Compared with children not exposed to the adult model, those who viewed the model's actions were more likely to lash out at the doll. Observing the aggressive outburst apparently lowered their inhibitions. But *something more* was also at work, for the children imitated the very acts they had observed and used the very words they had heard (**FIGURE 30.1**).

That "something more," Bandura suggests, was this: By watching a model, we experience *vicarious reinforcement* or *vicarious punishment,* and we learn to anticipate a behavior's consequences in situations like those we are observing. We are especially likely to learn from people we perceive

Courtesy of Albert Bandura, Stanford University

Figure 30.1
The famous Bobo doll experiment Notice how the children's actions directly imitate the adult's.

as similar to ourselves, as successful, or as admirable. Functional MRI scans show that when people observe someone winning a reward (and especially when it's someone likable and similar to themselves) their own brain reward systems activate, much as if they themselves had won the reward (Mobbs et al., 2009). When we identify with someone, we experience their outcomes vicariously. Lord Chesterfield (1694–1773) had the idea: "We are, in truth, more than half what we are by imitation."

Mirrors and Imitation in the Brain

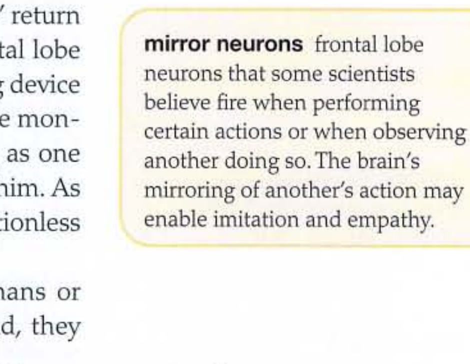
On a 1991 hot summer day in Parma, Italy, a lab monkey awaited its researchers' return from lunch. The researchers had implanted wires next to its motor cortex, in a frontal lobe brain region that enabled the monkey to plan and enact movements. The monitoring device would alert the researchers to activity in that region of the monkey's brain. When the monkey moved a peanut into its mouth, for example, the device would buzz. That day, as one of the researchers reentered the lab, ice cream cone in hand, the monkey stared at him. As the researcher raised the cone to lick it, the monkey's monitor buzzed—as if the motionless monkey had itself moved (Blakeslee, 2006; Iacoboni, 2008, 2009).

mirror neurons frontal lobe neurons that some scientists believe fire when performing certain actions or when observing another doing so. The brain's mirroring of another's action may enable imitation and empathy.

The same buzzing had been heard earlier, when the monkey watched humans or other monkeys move peanuts to their mouths. The flabbergasted researchers had, they believed, stumbled onto a previously unknown type of neuron (Rizzolatti et al., 2002, 2006). These presumed **mirror neurons** may provide a neural basis for everyday imitation and observational learning. When a monkey grasps, holds, or tears something, these neurons fire. And they likewise fire when the monkey observes another doing so. When one monkey sees, its neurons mirror what another monkey does.

Imitation is widespread in other species. In one experiment, a monkey watching another selecting certain pictures to gain treats learned to imitate the order of choices (**FIGURE 30.2** on the next page). In other research, rhesus macaque monkeys rarely made up quickly after a fight—unless they grew up with forgiving older macaques. Then, more often than not, their fights, too, were quickly followed by reconciliation (de Waal & Johanowicz, 1993). Rats, pigeons, crows, and gorillas all observe others and learn (Byrne et al., 2011; Dugatkin, 2002).

Mirror neurons at work?



David Sipress

"Your back is killing me!"

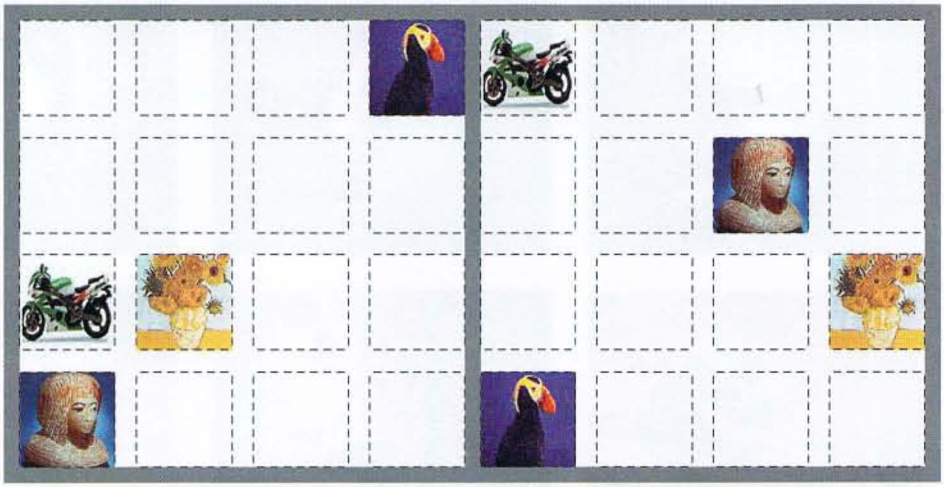


Figure 30.2
Cognitive imitation Monkey A (far left) watched Monkey B touch four pictures on a display screen in a certain order to gain a banana. Monkey A learned to imitate that order, even when shown the same pictures in a different configuration (Subiaul et al., 2004).

As Module 85 describes, chimpanzees observe and imitate all sorts of novel foraging and tool use behaviors, which are then transmitted from generation to generation within their local culture (Hopper et al., 2008; Whiten et al., 2007).

In humans, imitation is pervasive. Our catchphrases, fashions, ceremonies, foods, traditions, morals, and fads all spread by one person copying another. Imitation shapes even very young humans' behavior (Bates & Byrne, 2010). Shortly after birth, a baby may imitate an adult who sticks out his tongue. By 8 to 16 months, infants imitate various novel gestures (Jones, 2007). By age 12 months (**FIGURE 30.3**), they look where an adult is looking (Meltzoff et al., 2009). And by age 14 months, children imitate acts modeled on TV (Meltzoff, 1988; Meltzoff & Moore, 1989, 1997). Even as 2½-year-olds, when many of their mental abilities are near those of adult chimpanzees, young humans surpass chimps at social tasks such as imitating another's solution to a problem (Herrmann et al., 2007). Children see, children do.

So strong is the human predisposition to learn from watching adults that 2- to 5-year-old children *overimitate*. Whether living in urban Australia or rural Africa, they copy even irrelevant adult actions. Before reaching for a toy in a plastic jar, they will first stroke the jar with a feather if that's what they have observed (Lyons et al., 2007). Or, imitating an adult, they will wave a stick over a box and then use the stick to push on a knob that opens the box—when all they needed to do to open the box was to push on the knob (Nielsen & Tomaselli, 2010).

"Children need models more than they need critics." -JOSEPH JOUBERT, *PENSÉES*, 1842

Humans, like monkeys, have brains that support empathy and imitation. Researchers cannot insert experimental electrodes in human brains, but they can use fMRI scans to see brain activity associated with performing and with observing actions. So, is the human

Figure 30.3
Imitation This 12-month-old infant sees an adult look left, and immediately follows her gaze. (From Meltzoff et al., 2009.)

capacity to simulate another's action and to share in another's experience due to specialized mirror neurons? Or is it due to distributed brain networks? That issue is currently being debated (Gallese et al. 2011; Iacoboni, 2008, 2009; Mukamel et al., 2010). Regardless, children's brains enable their empathy and their ability to infer another's mental state, an ability known as *theory of mind.*

The brain's response to observing others makes emotions contagious. Through its neurological echo, our brain simulates and vicariously experiences what we observe. So real are these mental instant replays that we may misremember an action we have observed as an action we have performed (Lindner et al., 2010). But through these reenactments, we grasp others' states of mind. Observing others' postures, faces, voices, and writing styles, we unconsciously synchronize our own to theirs—which helps us feel what they are feeling (Bernieri et al., 1994; Ireland & Pennebaker, 2010). We find ourselves yawning when they yawn, laughing when they laugh.

When observing movie characters smoking, smokers' brains spontaneously simulate smoking, which helps explain their cravings (Wagner et al., 2011). Seeing a loved one's pain, our faces mirror the other's emotion. But as **FIGURE 30.4** shows, so do our brains. In this fMRI scan, the pain imagined by an empathic romantic partner has triggered some of the same brain activity experienced by the loved one actually having the pain (Singer et al., 2004). Even reading fiction may trigger such activity, as we mentally simulate (and vicariously experience) the experiences described (Mar & Oatley, 2008; Speer et al., 2009). The bottom line: *Brain activity underlies our intensely social nature.*

Wellcome Department of Imaging Neuroscience/ Science Source

Pain Empathy

Figure 30.4
Experienced and imagined pain in the brain Brain activity related to actual pain (left) is mirrored in the brain of an observing loved one (right). Empathy in the brain shows up in emotional brain areas, but not in the somatosensory cortex, which receives the physical pain input.

Applications of Observational Learning

30-2 What is the impact of prosocial modeling and of antisocial modeling?

So the big news from Bandura's studies and the mirror-neuron research is that we look, we mentally imitate, and we learn. Models—in our family or neighborhood, or on TV—may have effects, good or bad.

Prosocial Effects

The good news is that **prosocial** (positive, helpful) models can have prosocial effects. Many business organizations effectively use *behavior modeling* to help new employees learn communications, sales, and customer service skills (Taylor et al., 2005). Trainees gain these skills faster when they are able to observe the skills being modeled effectively by experienced workers (or actors simulating them).

prosocial behavior positive, constructive, helpful behavior. The opposite of antisocial behavior.


Zumapress/Newscom

A model caregiver This girl is learning orphan-nursing skills, as well as compassion from her mentor in this Humane Society program. As the sixteenth-century proverb states, "Example is better than precept."

People who exemplify nonviolent, helpful behavior can also prompt similar behavior in others. India's Mahatma Gandhi and America's Martin Luther King, Jr., both drew on the power of modeling, making nonviolent action a powerful force for social change in both countries. Parents are also powerful models. European Christians who risked their lives to rescue Jews from the Nazis usually had a close relationship with at least one parent who modeled a strong moral or humanitarian concern; this was also true for U.S. civil rights activists in the 1960s (London, 1970; Oliner & Oliner, 1988). The observational learning of morality begins early. Socially responsive toddlers who readily imitate their parents tend to become preschoolers with a strong internalized conscience (Forman et al., 2004).

Models are most effective when their actions and words are consistent. Sometimes, however, models say one thing and do another. To encourage children to read, read to them and surround them with books and people who read. To increase the odds that your children will practice your religion, worship and attend religious activities with them. Many parents seem to operate according to the principle "Do as I *say*, not as I do." Experiments suggest that children learn to do both (Rice & Grusec, 1975; Rushton, 1975). Exposed to a hypocrite, they tend to imitate the hypocrisy—by doing what the model did and saying what the model said.

Antisocial Effects

The bad news is that observational learning may have *antisocial effects*. This helps us understand why abusive parents might have aggressive children, and why many men who beat their wives had wife-battering fathers (Stith et al., 2000). Critics note that being aggressive could be passed along by parents' genes. But with monkeys we know it can be environmental. In study after study, young monkeys separated from their mothers and subjected to high levels of aggression grew up to be aggressive themselves (Chamove, 1980). The lessons we learn as children are not easily replaced as adults, and they are sometimes visited on future generations.

TV shows and Internet videos are a powerful source of observational learning. While watching TV and videos, children may "learn" that bullying is an effective way to control others, that free and easy sex brings pleasure without later misery or disease, or that men should be tough and women gentle. And they have ample time to learn such lessons. During their first 18 years, most children in developed countries spend more time watching TV shows than they spend in school. The average teen watches TV shows more than 4 hours a day; the average adult, 3 hours (Robinson & Martin, 2009; Strasburger et al., 2010).

TV-show viewers are learning about life from a rather peculiar storyteller, one that reflects the culture's mythology but not its reality. Between 1998 and 2006, prime-time violence reportedly increased 75 percent (PTC, 2007). If we include cable programming and video rentals, the violence numbers escalate. An analysis of more than 3000 network and cable programs aired during one closely studied year revealed that nearly 6 in 10 featured violence, that 74 percent of the violence went unpunished, that 58 percent did not show the victims' pain, that nearly half the incidents involved "justified" violence, and that nearly half involved an attractive perpetrator. These conditions define the recipe for the *violence-viewing effect* described in many studies (Donnerstein, 1998, 2011). To read more about this effect, see Thinking Critically About: Does Viewing Media Violence Trigger Violent Behavior?

FYI

Screen time's greatest effect may stem from what it displaces. Children and adults who spend several hours a day in front of a screen spend that many fewer hours in other pursuits—talking, studying, playing, reading, or socializing face-to-face with friends. What would you have done with your extra time if you had spent even half as many hours in front of a screen, and how might you therefore be different?

"The problem with television is that the people must sit and keep their eyes glued to a screen: The average American family hasn't time for it. Therefore the showmen are convinced that . . . television will *never* be a serious competitor of [radio] broadcasting."
-New York Times, 1939

Thinking Critically About

Does Viewing Media Violence Trigger Violent Behavior?

Was the judge who, in 1993, tried two British 10-year-olds for the murder of a 2-year-old right to suspect that the pair had been influenced by "violent video films"? Were the American media right to wonder if Adam Lanza, the 2012 mass killer of young children and their teachers at Connecticut's Sandy Hook Elementary School, was influenced by his playing of the violent video games found stockpiled in his home? To understand whether violence viewing leads to violent behavior, researchers have done some 600 correlational and experimental studies (Anderson & Gentile, 2008; Comstock, 2008; Murray, 2008).

Correlational studies do support this link:

- In the United States and Canada, homicide rates doubled between 1957 and 1974, just when TV was introduced and spreading. Moreover, census regions with later dates for TV service also had homicide rates that jumped later.
- White South Africans were first introduced to TV in 1975. A similar near-doubling of the homicide rate began after 1975 (Centerwall, 1989).
- Elementary schoolchildren with heavy exposure to media violence (via TV, videos, and video games) tend to get into more fights (**FIGURE 30.5**). As teens, they are at greater risk for violent behavior (Boxer et al., 2009).

But as we know from Unit II, correlation need not mean causation. So these studies do not prove that viewing violence causes aggression (Freedman, 1988; McGuire, 1986). Maybe aggressive children prefer violent programs. Maybe abused or neglected children are both more aggressive and more often left in front of the TV or computer. Maybe violent programs simply reflect, rather than affect, violent trends.

To pin down causation, psychologists experimented. They randomly assigned some viewers to observe violence and others to watch entertaining nonviolence. Does viewing cruelty prepare people, when irritated, to react more cruelly? To some extent, it does. This is especially so when an attractive person commits seemingly justified, realistic violence that goes unpunished and causes no visible pain or harm (Donnerstein, 1998, 2011).

The violence-viewing effect seems to stem from at least two factors. One is *imitation* (Geen & Thomas, 1986). Children as young as 14 months will imitate acts they observe on TV (Meltzoff & Moore, 1989, 1997). As they watch, their brains simulate the behavior, and after this inner rehearsal they become more likely to act it out. Thus, in one experiment, violent play increased sevenfold immediately after children viewed *Power Rangers* episodes (Boyatzis et al., 1995). As happened in the Bobo doll experiment, children often precisely imitated the models' violent acts—in this case, flying karate kicks.

Prolonged exposure to violence also *desensitizes* viewers. They become more indifferent to it when later viewing a brawl, whether on TV or in real life (Fanti et al., 2009; Rule & Ferguson, 1986). Adult males who spent three evenings watching sexually violent movies became progressively less bothered by the rapes and slashings. Compared with those in a control group, the film watchers later expressed less sympathy for domestic violence victims, and they rated the victims' injuries as less severe (Mullin & Linz, 1995). Likewise, moviegoers were less likely to help an injured woman pick up her crutches if they had just watched a violent rather than a nonviolent movie (Bushman & Anderson, 2009).

Drawing on such findings, the American Academy of Pediatrics (2009) has advised pediatricians that "media violence can contribute to aggressive behavior, desensitization to violence, nightmares, and fear of being harmed." Indeed, an evil psychologist could hardly imagine a better way to make people indifferent to brutality than to expose them to a graded series of scenes, from fights to killings to the mutilations in slasher movies (Donnerstein et al., 1987). Watching cruelty fosters indifference.

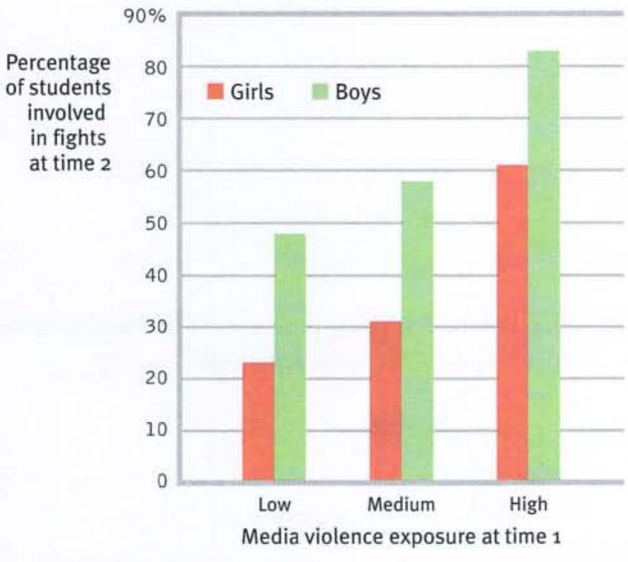


Figure 30.5 Heavy exposure to media violence predicts future aggressive behavior Researchers studied more than 400 third- to fifth-graders. After controlling for existing differences in hostility and aggression, the researchers reported increased aggression in those heavily exposed to violent TV, videos, and video games (Gentile et al., 2004).

* * *

Our knowledge of learning principles comes from the work of hundreds of investigators. This unit has focused on the ideas of a few pioneers—Ivan Pavlov, John Watson, B. F. Skinner, and Albert Bandura. They illustrate the impact that can result from single-minded devotion to a few well-defined problems and ideas. These researchers defined the issues and impressed on us the importance of learning. As their legacy demonstrates, intellectual history is often made by people who risk going to extremes in pushing ideas to their limits (Simonton, 2000).

Before You Move On

▶ ASK YOURSELF

Who has been a significant role model for you? For whom are you a model?

▶ TEST YOURSELF

Jason's parents and older friends all smoke, but they advise him not to. Juan's parents and friends don't smoke, but they say nothing to deter him from doing so. Will Jason or Juan be more likely to start smoking?

Answers to the Test Yourself questions can be found in Appendix E at the end of the book.

Module 30 Review

30-1 What is observational learning, and how do some scientists believe it is enabled by mirror neurons?

- In *observational learning,* as we observe and imitate others we learn to anticipate a behavior's consequences, because we experience vicarious reinforcement or vicarious punishment.
- Our brain's frontal lobes have a demonstrated ability to mirror the activity of another's brain. The same areas fire when we perform certain actions (such as responding to pain or moving our mouth to form words), as when we observe someone else performing those actions.

30-2 What is the impact of prosocial modeling and of antisocial modeling?

- Children tend to imitate what a model does and says, whether the behavior being *modeled* is *prosocial* (positive, constructive, and helpful) or antisocial.
- If a model's actions and words are inconsistent, children may imitate the hypocrisy they observe.

Multiple-Choice Questions

1. Bandura's famous Bobo doll experiment is most closely associated with which of the following?

a. Latent learning
b. Classical conditioning
c. Operant conditioning
d. Cognitive maps
e. Observational learning

2. Which of the following processes is the best term for explaining how we learn languages?

a. Biofeedback
b. Discrimination
c. Modeling
d. Insight
e. Creativity

3. Which of the following is the most likely consequence of the brain's tendency to vicariously experience something we observe?

a. Actual physical injury
b. The risk of misremembering our own actions
c. Interference with associative learning
d. The elimination of classically conditioned responses to stimuli
e. A confusion between reinforcers and rewards in an operant conditioning setting

4. When is prosocial modeling most effective?

a. When the model acts in a way consistent with the prosocial lesson
b. When the model verbally emphasizes the prosocial lesson but acts as she chooses
c. When the model is predisposed to the prosocial conduct
d. When the observer has a close personal relationship with the model
e. When the model is well-known

5. Which of the following is the best synonym for social learning?

a. Observational learning
b. Modeling
c. Mirror neuron imitation
d. Prosocial model
e. Imitation

Practice FRQs

1. Explain how Bandura's Bobo doll experiment illustrates each of the following:

- Modeling
- Mirror neurons

Answer

1 point: Modeling can be described as the behavior of the child as he or she imitates the adult.

1 point: Mirror neurons on the child's brain presumably would fire the same way when watching the adult or when imitating the adult's behavior.

2. A young boy is left at home with his older brother while their parents drop off the family car for repairs. While the parents are out, the older brother prepares lunch for the young boy. Then the older brother takes the younger brother outside where he entertains him by building several fires with small twigs. Explain how the older brother's conduct is:

- Prosocial modeling
- Antisocial modeling

(2 points)

Unit VI Review

Key Terms and Concepts to Remember

learning, p. 263
habituation, p. 264
associative learning, p. 264
stimulus, p. 264
cognitive learning, p. 265
classical conditioning, p. 266
behaviorism, p. 266
neutral stimulus (NS), p. 266
unconditioned response (UR), p. 267
unconditioned stimulus (US), p. 267
conditioned response (CR), p. 268
conditioned stimulus (CS), p. 268
acquisition, p. 268
higher-order conditioning, p. 268
extinction, p. 269
spontaneous recovery, p. 269
generalization, p. 269
discrimination, p. 270
operant conditioning, p. 275
law of effect, p. 275
operant chamber, p. 276
reinforcement, p. 276
shaping, p. 276
discriminative stimulus, p. 277
positive reinforcement, p. 277
negative reinforcement, p. 278
primary reinforcer, p. 278
conditioned reinforcer, p. 278
reinforcement schedule, p. 279
continuous reinforcement, p. 279
partial (intermittent) reinforcement, p. 279
fixed-ratio schedule, p. 279
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punishment, p. 281
biofeedback, p. 289
respondent behavior, p. 289
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cognitive map, p. 297
latent learning, p. 297
insight, p. 297
intrinsic motivation, p.297
extrinsic motivation, p. 298
coping, p. 298
problem-focused coping, p. 298
emotion-focused coping, p. 298
learned helplessness, p. 299
external locus of control, p. 300
internal locus of control, p. 300
self-control, p. 301
observational learning, p. 304
modeling, p. 304
mirror neurons, p. 305
prosocial behavior, p. 307

Key Contributors to Remember

Ivan Pavlov, p. 266
John B. Watson, p. 266
B. F. Skinner, p. 275
Edward Thorndike, p. 275
John Garcia, p. 293
Robert Rescorla, p. 296
Edward Tolman, p. 297
Albert Bandura, p. 304

AP® Exam Practice Questions

Multiple-Choice Questions

1. Which of the following most accurately describes an impact of punishment?

a. Punishment is a good way to increase a behavior, as long as it is not used too frequently.
b. Punishment may create problems in the short term but rarely produces long-term side effects.
c. Punishment can be effective at stopping specific behaviors quickly.
d. Punishment typically results in an increase of a behavior that caused the removal of an aversive stimulus.
e. Punishment should never be used (in the opinion of most psychologists), because the damage it causes can never be repaired.

2. Which of the following is an application of shaping?

a. A mother who wants her daughter to hit a baseball first praises her for holding a bat, then for swinging it, and then for hitting the ball.
b. A pigeon pecks a disk 25 times for an opportunity to receive a food reinforcement.
c. A rat presses a bar when a green light is on but not when a red light is on.
d. A rat gradually stops pressing a bar when it no longer receives a food reinforcement.
e. A gambler continues to play a slot machine, even though he has won nothing on his last 20 plays, and he has lost a significant amount of money.

3. What is one of the principal functions of mirror neurons?

a. To allow an organism to replace an unconditioned response with a conditioned response
b. To help produce intrinsic motivation in some children
c. To be the mechanism by which the brain accomplishes observational learning
d. To produce the neural associations that are the basis of both classical and operant conditioning
e. To explain why modeling prosocial behavior is more effective than modeling negative behavior

4. Which of the following illustrates generalization?

a. A rabbit that has been conditioned to blink to a tone also blinks when a similar tone is sounded.
b. A dog salivates to a tone but not to a buzzer.
c. A light is turned on repeatedly until a rat stops flexing its paw when it's turned on.
d. A pigeon whose disk-pecking response has been extinguished is placed in a Skinner box three hours later and begins pecking the disk again.
e. A child is startled when the doorbell rings.

5. What did Albert Bandura's Bobo doll experiments demonstrate?

a. Children are likely to imitate the behavior of adults.
b. There may be a negative correlation between televised violence and aggressive behavior.
c. Children are more likely to copy what adults say than what adults do.
d. Allowing children to watch too much television is detrimental to their development.
e. Observational learning can explain the development of fears in children.

6. What did Robert Rescorla and Allan Wagner's experiments establish?

a. That the acquisition of a CR depends on pairing the CS and the US
b. That different species respond differently to classical conditioning situations
c. The current belief that classical conditioning is really a form of operant conditioning
d. That mirror neurons form the biological basis of classical conditioning
e. The importance of cognitive factors in classical conditioning

7. What does Edward Thorndike's law of effect state?

a. The difference between positive and negative reinforcement
b. That behavior maintained by partial reinforcement is more resistant to extinction than behavior maintained by continuous reinforcement
c. How shaping can be used to establish operant conditioning
d. That rewarded behavior is more likely to happen again
e. The limited effectiveness of punishment

8. Which of the following processes would produce the acquisition of a conditioned response?

a. Repeatedly present an unconditioned response
b. Administer the conditioned stimulus without the unconditioned stimulus
c. Make sure that the conditioned stimulus comes at least one minute before the unconditioned stimulus
d. Pair a neutral stimulus with an unconditioned stimulus several times
e. Present the conditioned stimulus until it starts to produce an unconditioned response

9. Which of the following would help determine what stimuli an organism can distinguish between?

a. Negative reinforcement
b. A variable-ratio schedule of reinforcement
c. A fixed-ratio schedule of reinforcement
d. Extinction
e. A discriminative stimulus

10. A student studies diligently to avoid the bad feelings associated with a previously low grade on a test. In this case, the studying behavior is being strengthened because of what kind of reinforcement?

a. Positive reinforcement
b. Negative reinforcement
c. Delayed reinforcement
d. Primary reinforcement
e. Conditioned reinforcement

11. Taste aversion studies lead researchers to which of the following conclusions?

a. Taste is the most fundamental of the senses.
b. There are genetic predispositions involved in taste learning.
c. Animals must evaluate a situation cognitively before taste aversion develops.
d. Taste aversion is a universal survival mechanism.
e. An unconditioned stimulus must occur within seconds of a CS for conditioning to occur.

12. Mary checks her phone every 30 minutes for incoming text messages. Her behavior is being maintained by what kind of reinforcement schedule?

a. Fixed-interval
b. Variable-interval
c. Variable-ratio
d. Fixed-ratio
e. Continuous

13. A dog is trained to salivate when it hears a tone associated with food. Then the tone is sounded repeatedly without an unconditioned stimulus until the dog stops salivating. Later, when the tone sounds again, the dog salivates again. This is a description of what part of the conditioning process?

a. Spontaneous recovery
b. Extinction
c. Generalization
d. Discrimination
e. Acquisition

14. Latent learning is evidence for which of these conclusions?

a. Punishment is an ineffective means of controlling behavior.
b. Negative reinforcement should be avoided when possible.
c. Cognition plays an important role in operant conditioning.
d. Conditioned reinforcers are more effective than primary reinforcers.
e. Shaping is usually not necessary for operant conditioning.

15. Classical and operant conditioning are based on the principles of which psychological perspective?

a. Cognitive
b. Biological
c. Behaviorist
d. Evolutionary
e. Humanist

Free-Response Questions

1. Briefly explain how the concepts below could be used to help a child stop throwing temper tantrums.

- Extinction (operant conditioning)
- Positive reinforcement
- Modeling
- Negative reinforcement
- Shaping
- Extinction (classical conditioning)

Rubric for Free Response Question 1

1 point: **Extinction (operant conditioning)** The child might be throwing a temper tantrum because that behavior is being reinforced (for example, it gains the child desired attention from a parent). Extinction could be used to stop the temper tantrum by removing the reinforcement. Without the reinforcement, eventually the behavior (tantrums) should decrease. Pages 279, 290

1 point: **Positive reinforcement** A positive reinforcement (such as reading a favorite book) could be used to encourage a behavior other than temper tantrums. The child could be given the positive reinforcement after a "prosocial" behavior, such as sharing a toy with a friend instead of throwing a tantrum. Page 277

1 point: **Modeling** The child might learn to avoid temper tantrums through modeling or observational learning. A parent or other adult could show positive behaviors when disappointed, and the child might imitate this behavior. Page 304

1 point: **Negative reinforcement** Negative reinforcement occurs when a stimulus is removed, and this removal reinforces a behavior. In this situation, a parent or adult could sit the child on a "time-out" seat as soon as the temper tantrum begins. The child could leave the time out seat as soon as she or he stops crying. The removal of the aversive stimulus of the time out seat could reinforce not crying, and help to stop the temper tantrums. Page 278

1 point: **Shaping** A parent or other adult could gradually shape the child's negative behavior toward desired behaviors by rewarding successive approximations. For example, a child could first be rewarded for crying more quietly during a tantrum, then for stopping yelling, then for avoiding the tantrum completely. Page 276

1 point: **Extinction (classical conditioning)** In the context of classical conditioning, a behavior becomes extinct because a neutral stimulus is repeatedly presented without the unconditioned stimulus. For example, a child might have been classically conditioned to throw a tantrum whenever the child's brother is present, because the brother always pinches the child. The tantrums could be made extinct by convincing the brother to stop the pinching. The conditioned stimulus (the brother) is presented to the child without the unconditioned stimulus (the pinching). After repeated pairings, the conditioned response of the tantrum should become extinct. Pages 269, 290

Multiple-choice self-tests and more may be found at www.worthpublishers.com/MyersAP2e

2. Martin is a sixth-grade teacher who feels he is not able to connect with some of his students. Several of them have had academic problems in the past and although Martin feels that they can do the work, he believes that these students have given up. Explain how Martin could use each of these concepts to learn how best to help his students succeed.

- External locus of control
- Self-control
- Learned helplessness
- Intrinsic motivation

(4 points)

3. Researchers investigating conditioning throughout the history of psychology reached very different conclusions about how humans learn behaviors. Explain how these theorists might explain this example of behavior and response: A child cries when she sees a large pile of peas on her dinner plate.

- Edward Thorndike
- B. F. Skinner
- Ivan Pavlov
- Albert Bandura

(4 points)